U.S. ARMY NATICK SOLDIER SYSTEMS CENTER

BROAD AGENCY ANNOUNCEMENT (BAA)

Solicitation Number "05 - 07 Natick BAA"

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(Updated 3 October 2005 to include contractor manpower requirements and accounting system verification for cost type contracts to Section III and topic G.2 to Section VI)

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SECTION I - INTRODUCTION

The mission of the U.S. Army Natick Soldier Systems Center (NSC) is to assure maximum survivability, supportability, sustainability and combat-effectiveness of individual soldiers and crews on the battlefield under world-wide environmental extremes.

Our goal is to provide the American warfighter the best equipment for the best price through research, development and engineering in the areas of combat feeding equipment and systems, combat ration research and development (R&D), warrior systems technologies, tentage, fabric structures, and rigid wall shelters, airdrop - advanced personnel and cargo airdrop systems, textile technologies, modeling and simulation, neuroepidemiology, national protection, and Small Unmanned Air Vehicles (SUAVs) and Advanced Technology. We are deeply committed to making our soldiers, and all service members, the best clothed, equipped, sheltered, and fed in the world.

This Broad Agency Announcement (BAA) is intended to fulfill requirements for scientific study and experimentation directed toward advancing state-of-the-art technologies, and/or increasing knowledge and understanding as a means of eliminating current technology barriers. This BAA DOES NOT focus on specific systems or hardware solutions. This BAA identifies NSC research/exploratory development areas of interest, and provides prospective offerors information on the preparation of proposals, along with proposal evaluation factors. The government may award purchase orders, contracts, grants, cooperative agreements or other transactions against this BAA.

Please note that, typically, research resulting from work executed under this BAA leads to an additional requirement for services being provided by the applicable contractor in support of operational experiments to evaluate the measures of merit and performance enhancement capability to the warfighters. However, it is not possible at the time of release of this announcement, or at the time of contract award, to accurately anticipate if these services will be required, nor is it possible to anticipate the level of effort required. In addition, the technology explored under this BAA typically has application across the various branches of the Department of Defense (DoD). In order to satisfy the unique needs of these different branches, and to ensure a proper job is done in the evaluation of the applicable technology, contract modifications which add new Contract Line Item Numbers (CLINs), and/or expand on current CLINs, for services providing for flexibility in technology assessment (with technology transition the ultimate goal) may be executed. In the event that this is required, it shall be considered to be within the scope of this BAA and the resulting contract, and therefore will have met the requirements of the Federal Acquisition Regulation (FAR)/DoD FAR (DFARS) and the Competition in Contracting Act. The benefit of this flexibility to the government, and ultimately the taxpayer, is a significant increase in the R&D return on investment. The flexibility to have multiple users (branches of the military) in the technology evaluation cycle is absolutely critical and allows systems and technologies to be developed in a manner that has broader DoD market applications. These can then be modularly reconfigured to meet goals and objectives for all DoD services.

SECTION II - CONCEPT PAPERS AND PROPOSALS

1. WHO MAY SUBMIT

   a. The NSC will consider concept papers and proposals based on this BAA from the following organizations and firms interested in conducting scientific research: colleges and universities, nonprofit research institutes, foreign organizations, and commercial firms (including small businesses, large businesses, HUBZone small businesses, minority businesses, and women owned businesses). Offerors are cautioned that only a duly appointed Contracting Officer acting within the scope and limits of his/her authority may obligate the government to the expenditure of funds. Proposals from government facilities and organizations WILL NOT be considered under this program announcement.

   b. Small Businesses (SBs), Small Disadvantaged Businesses (SDBs), HUBZone Small Businesses, Historically Black Colleges and Universities (HBCUs) and Minority Institutions (MIs): Although no portion of this BAA has been set aside for SBs, SDBs, HUBZones, HBCUs, or MIs, their participation is highly encouraged. For any topic areas (see Section VI) where sufficient quality proposals are received that demonstrate a set-aside would be appropriate, NSC will consider doing so and modifying this BAA accordingly. Therefore, all named business types are encouraged to submit proposals under any topic that they feel they are highly qualified to perform. The applicable North American Industry Classification System (NAICS) code for the majority of work submitted under this BAA will be 541710 with a size standard of 500 employees.

2. WHEN TO SUBMIT

   a. This BAA shall remain in effect until 31 March 2007 unless superseded, extended or canceled. Concept papers will be accepted up until the close of business on 28 February 2007. Proposals may be submitted at any time after the concept paper has been approved and up until the BAA closing date of 31 March 2007. Awards against this BAA may be made up until 30 June 2007.

   b. The contractor agrees that if their offer is accepted by the government within ninety (90) calendar days from the date of their proposal, to furnish any or all items upon which prices are offered at the price set opposite each item, delivered at the designated point(s), within the time specified in the schedule. At times, the government may contact a contractor after the ninety (90) day period about a proposal they would like to bring to award. This will occur when a shortage of funds exists during the initial ninety (90) day period. If this does occur, the contractor reserves the right to except or decline the offer, and may also submit a revised proposal with any necessary price/schedule changes, though the technical merit must remain the same.

3. WHERE TO SUBMIT

Concept papers, proposals and inquires shall be submitted to the address indicated under each scientific and technical area of interest as cited in Section VI herein. Facsimile submission is normally not an authorized means for the delivery of such documents. The contractor shall receive prior approval from applicable point of contact (POC) for facsimile submissions.

4. BAA PROCESS

In an effort to minimize proposal preparation costs, this BAA will utilize a two-step process. The first step will be the submission of a concept paper. This step will preclude unwarranted effort on the part of an offeror whose proposed technology/capability or product is not of interest to the government. Those concept papers found to be consistent with the intent of the BAA and which are of interest to the government will be invited to submit a proposal (step two).

Communication with the technical POCs identified in Section VI. Scientific and Technical Areas Of Interest (as well as the POCs listed for Safety and MANPRINT) is essential in tailoring responses to the specific needs of NSC. This preliminary communication is especially important because once the formal proposal is accepted by the technical POC and submitted to the NSC's contracting office, no further communication between the proposed contractor and the government technical POC is allowed.

Requests for conference or symposium support, consultant services, engineering and/or marketing services, and/or training support will not be considered under this announcement. Only concepts for research/exploratory development will be considered.

Contractors should not submit a proposal until selected government personnel have reviewed the concept paper and the contractor has been invited to submit a formal proposal by government personnel.

a. STEP ONE: If the offeror has a novel research approach within an area of interest covered by this BAA, a BAA concept paper should be prepared. Concept papers should be submitted electronically to the technical POCs listed in each area of interest in Section VI. Concept papers may not exceed 5 single-sided 8 ½ x 11 inch typed pages (including charts, graphs, photographs, etc.) and shall include the following:

   (1) A brief technical explanation of the proposed effort that addresses the major research thrust, the research goals, and deliverables, a proposed approach to achieve these goals and deliverables, and military relevancy.
   (2) A brief "management" description outlining key personnel and experience.
   (3) Any past performance the contractor has had with similar research efforts.
   (4) An estimated cost/price and performance schedule for the work.

Once an offeror has been invited to submit a formal proposal, the following process must be adhered to by the offeror.

b. STEP TWO: Informal exchanges should be held with the technical POC listed under each topical area noted in Section VI herein on any proposed research BEFORE the submission of a formal proposal since the BAA is written in such broad terms to cover a wide variety of technical areas.

The offeror's technical, management, cost/price, past performance, subcontracting (if applicable), and company certification sections of the proposal shall be submitted in severable sections as set forth below. All information pertaining to each section shall be confined to the appropriate part.

The sections shall be as brief as possible, consistent with complete submission. Pages should not exceed 8-1/2 inches in width and 11 inches in length; however, fold-out pages depicting such items as sketches, etc., may be used. The proposal shall be evaluated in accordance with the process described in Section IV herein.

PART I - Technical Section - automated and/or one (1) original
PART II - Management Section - automated and/or one (1) original
PART III - Cost/Price Section - automated and/or one (1) original
PART IV - Past Performance Section - automated and/or one (1) original
PART V - Subcontracting (if applicable) - automated and/or one (1) original
PART VI - Contractor Representations and Certifications - automated and/or one (1) original

(1) **Part I - Technical Section:** Offeror is responsible for including sufficient details, without reference to cost/price, to permit a complete and accurate evaluation of the proposal from a strictly technical standpoint. The following information shall be included:

(a) Specific BAA topic area by number and title for which the proposal is being submitted under.

(b) A summary of the objective/purpose of proposed research - what scientific "problem" do you intend to resolve, advance the state-of-the-art with respect to, or increase the understanding of.

(c) Identification of product(s) or process(es) which you anticipate will result from this effort. Product(s) may simply be technical data, reports on the feasibility of novel concepts, product samples, etc. Also address any MANPRINT and/or safety requirements or state that no such requirements exist. For specific details and guidance on MANPRINT and safety requirements see Section V herein.

(d) Identification of any potential military and/or civilian applications of the product(s) which may be developed if the work performed under the proposed BAA contract is followed through on, following completion of the proposed contract.

(e) An assessment of the probability for project success.

(f) An explanation of the planned approach, techniques, and/or processes to be used in this effort.

(g) Rationale for the proposed methodology. What, if any, innovative ideas/ techniques will be tried? Identification of the technical risks in completing this project and the approach taken to overcome these risks.

(h) Any planned interactions with NSC (to include a request for a post-award conference if the contractor so desires) required during the performance of proposed contract.

(i) Any planned collaborative arrangements with other parties (including subcontractors and/or consultants) for the effort. Identification of the responsibilities and contributions of these parties in completing the intended deliverables. If offeror is an academic institution, details of planned interactions with industry (if applicable), and letters from the industries in which they commit themselves to support the effort, should be provided.

(j) A list of the deliverables (technical data, processes, publications, prototypes, etc.) that will result from the effort plus demonstration of a clear pathway from the research to the intended deliverables.

(k) A schedule containing milestones for the performance of the proposed effort.

(2) **Part II - Management Section:** The management section of the proposal shall include the following for the offeror and any collaborators identified in Part I:

(a) Resumes (or some portion of such) of technical personnel detailing education, experience, and technical expertise proposed for this effort and the percentage of time expected to be devoted to this project.

(b) Organization of the offeror's firm.

(c) Facilities and equipment available for the proposed effort.

(d) Project management systems and controls to be utilized by the contractor.

(3) **Part III - Cost/Price Section:**

(a) The offeror is required to submit either certified cost and pricing data (for proposals greater than $550,000) or information other than cost or pricing data (see FAR Subpart 15.403-5). Certified cost and pricing data shall be submitted in accordance with Table 15-2 in FAR Subpart 15.408. Sufficient cost/price information is required to allow the government to make a determination of fair and reasonable price and cost realism. The information shall be submitted at the level of detail described below and may be submitted in the offeror's own format. Examples of cost/price data are as follows:

- Materials, including raw materials and purchased parts and test equipment;
- Labor with engineering, manufacturing and service labor shown as separate elements; each labor category should cite hours of labor, hourly rate of pay, and total labor cost;
- Other direct cost, with supporting documentation;
- Costs for contractors with whom the lead contractor is teaming;
- Overhead cost and rates;
- Facilities capital cost of money (note: if facilities capital cost of money is requested, the offeror shall submit a DD Form 1861);
- Consultant costs, if applicable, shall include the names of the consultants, purpose on the project, number of days to be employed, and rates of pay per day;
- Profit or fee (if applicable).

(b) Cost/Price Realism: A proposal is presumed to represent an offeror's best efforts to respond to the solicitation. Any inconsistency, whether real or apparent, between promised performance and cost/price, should be explained in the proposal. For example, if the intended use of new and innovative production techniques is the basis for an abnormally low estimate, the nature of these techniques and their impact on cost/price should be explained; or, if a corporate policy decision has been made to absorb a portion of the estimated cost, that should be stated in the proposal. Any significant inconsistency, if unexplained, raises a fundamental issue of the offeror's understanding of the nature and scope of work required and of its financial ability to perform the contract, and may be grounds for rejection of the proposal. The contractor shall supply the government with sufficient information to allow the government to assess the reasonableness of the contractor's costs/prices.

(4) **Part IV - Past Performance Section**:

(a) Information should be submitted for all proposed first-tier subcontractors with whom the offeror is teaming, as well as the offeror.

(b) Offeror should submit past performance information on any contracts (as a prime or subcontractor) they worked on during the previous three (3) years which are relevant to the efforts required by this solicitation. In addition, any and all contracts terminated in whole or part during the previous five (5) years, to include those currently in the process of such termination, are considered relevant and the offeror shall provide past performance information for those contracts. The following information should be included:

- Role as prime or subcontractor
- If from past government contract, the contracting activity, address, and the contracting officer's name, telephone/facsimile numbers and email address
- Contract type
- Awarded cost/price
- Final, or projected final, cost/price
- Original delivery schedule
- Final, or projected final, delivery schedule

(c) For each of the contracts described in the past performance section of the offeror's proposal, a description of the objectives achieved, detailing how the effort is similar to the requirements of this solicitation, shall be included. For any contracts that did not/do not meet the original requirements with regard to original cost/price, schedule, or technical performance, the offeror should provide a brief explanation of the reason(s) for such shortcomings and any demonstrated corrective actions taken to avoid recurrence. For any terminated contracts, the offeror shall indicate the termination type and reasons.

(5) **Part V - Subcontracting Plans** (if applicable):

Once proposals are accepted by the technical POCs and submitted to the Contracting Office for evaluation, the Contracting Officer may decide a subcontracting plan from the offeror is required. This will be dependant upon the contract value and whether or not subcontracting possibilities exist. This requirement shall NEVER apply to small business concerns.

Should a subcontracting plan be required, the offeror shall prepare it in accordance with FAR clause 52.219-9, and DFARs clause 252.219-7003 (also, for reference, see Appendix DD, AFARS Part 19.7). During the time period this BAA is in effect the small, small disadvantaged, HUBZone, and woman-owned subcontracting goal percentages will vary. Therefore, should a subcontracting plan be required the Contracting Officer will establish goals for the offeror at the time one is requested.

As submitted under this BAA, subcontracting plans will be reviewed for adherence to regulations cited in FAR Part 19 and its supplements and not necessarily for evaluation as a specific evaluation criterion. However, an offeror's refusal to submit a subcontracting plan is grounds for the government to not negotiate award of an offeror's BAA proposal.

(6) **Part VI - Contractor Representations and Certifications:**

Provided as an attachment to this Broad Agency Announcement is a document which lists FAR and DFAR provisions and clauses which need to be filled out* by the contractor and returned with the proposal. Note that not all provisions/clauses will be applicable to every company so if one does not apply the offeror shall mark as such with an N/A. Also note that the applicable NAICS code for the majority of work submitted under this BAA will be 541710 with a size standard of 500 employees. If the offeror feels a different NAICS applies then provision 52.219-1 may be altered by the offeror accordingly.

* If the contractor has completed all the annual representations and certificates electronically on Online Representations and Certifications Application (ORCA) at http://orca.bpn.gov then they are not required to fill out this document and should note in part VI of their proposal what their Dun and Bradstreet Data Universal Numbering System (DUNS) number is and the fact that they are in ORCA. Please note that if a contractor does regular business with DoD, or intends to start, the NSC strongly recommends they complete the electronic certifications at ORCA to ease their business practices with the government.

SECTION III - ADDITIONAL INFORMATION ABOUT PROPOSAL SUBMISSIONS

GOVERNMENT FURNISHED PROPERTY (GFP)

Government-furnished property, as defined in FAR Part 45, may be available for contractor use during the performance of a given contract awarded against this BAA.

a. The offeror should clearly request in its proposal what, if anything, it desires as GFP for the given project. It is recommended that a section in the technical or management proposal be set aside to summarize the GFP requirements.

b. The offeror may request, for incorporation in the contract, a GFP delivery schedule NOT based specifically on the date of contract award.

c. Any property furnished to, and accepted by, the government under a resultant contract, and subsequently returned to the contractor for any reason, shall be regarded as government furnished property.

d. Any facilities, including rooms, desks, etc., to be provided to a contractor by the government for the performance of any portion of a contract, is considered to be GFP, and if needed should be specifically requested for the applicable time frames in the offeror's proposal.

TYPE OF CONTRACT

Contract type may vary according to the degree and timing of the responsibility assumed by the contractor for the cost of performance and the amount and nature of the profit incentive offered to the contractor for achieving or exceeding specific standards and goals. See FAR Subpart 16.101(a). Offerors shall identify the type(s) of contract (FAR Part 16) they feel is(are) best suited to the proposed effort. The offeror shall note that, in accordance with FAR Subpart 16.301-3, in order to receive a cost type contract, their accounting system must be adequate for determining costs on a government contract. This is determined by the Defense Contract Audit Agency (DCAA) assigned to the offeror's business location and may take thirty (30) to forty (40) days for completion. An offeror's suggestion regarding suitable contract type does not obligate the government to employ the suggested contract type. The selection of the contract type is subject to negotiation. Note that in addition to a contract, an offeror may propose a purchase order, grant, cooperative agreement, or other transaction as stated in the introduction portion of this BAA.

PREPARATION COSTS

It must be clearly understood that the receipt and review of concept papers and proposals as described in this BAA by the government is entirely for the purpose of technical evaluation and in no way constitutes an agreement to enter into contractual or other relationships. It must be further understood that the submission of such documents is voluntary and must be done solely at the offeror's expense. The government will in no way be held liable for, nor reimburse, an offeror for any expenses (direct or indirect) incurred in the process of formulating or submitting such documents.

AVAILABILITY OF FUNDS

It must be clearly understood that, as of the date of release of this BAA, there are no funds committed for any project. Until such time as funds are released to the Contracting Officer, no contract can, or will, be made for an otherwise acceptable proposal.

FAR INFORMATION/REFERENCES

All FAR information/references, plus other related acquisition information may be found on the Internet at any of the following addresses:

http://www.arnet.gov/far/
http://farsite.hill.af.mil/VFFARa.htm
http://web2.deskbook.osd.mil/default.asp

CENTRAL CONTRACTOR REGISTRATION (CCR)

By submission of an offer, the offeror acknowledges the requirement that prospective awardees MUST be registered in the CCR database prior to award, during performance, and through final payment of any contract resulting from this solicitation. Lack of registration in the CCR database shall make an offeror ineligible for award. Offerors that are not registered should consider applying for registration immediately upon receipt of this solicitation. To remain registered in the CCR database after the initial registration, the contractor is required to confirm on an annual basis that its information in the CCR database is accurate and complete. For all CCR information (including any exemptions) go to http://www.ccr.gov/ or phone 1-888-227-2423 (269-961-4725 if outside USA).

INVOICING AND PAYMENTS

All payments by the government under contracts awarded from this BAA shall be made by electronic funds transfer (EFT) or the government VISA purchase card. If not paid by VISA, then invoices shall be submitted electronically in accordance with DFARs clause #252.232.7003, which will be included in any resulting contract from this BAA. The automated method being used at NSC is the Wide Area Workflow (WAWF) system found at https://wawf.eb.mil. Contractors are encouraged to view this website and familiarize themselves with the invoicing process. More specific instructions on WAWF will be provided in any BAA award document.

RESTRICTED DATA ON PROPOSALS

As stated in FAR clause #52.215-1--Instructions to Offerors - Competitive Acquisition, the following guidance is provided for contractors desiring to restrict any information in their concept paper or proposal:

Offerors that include in their proposals data that they do not want disclosed to the public for any purpose, or used by the government except for evaluation purposes, shall --

(1) Mark the title page with the following legend:

This proposal includes data that shall not be disclosed outside the government and shall not be duplicated, used, or disclosed -- in whole or in part -- for any purpose other than to evaluate this proposal. If, however, a contract is awarded to this offeror as a result of -- or in connection with -- the submission of this data, the government shall have the right to duplicate, use, or disclose the data to the extent provided in the resulting contract. This restriction does not limit the government's right to use information contained in this data if it is obtained from another source without restriction. The data subject to this restriction are contained in sheets [*insert numbers or other identification of sheets*]; and

(2) Mark each sheet of data it wishes to restrict with the following legend:

Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal.

ARMY CONTRACTOR MANPOWER REPORTING

Beginning in March 2005 an Army initiative to obtain better visibility of the contractor service workforce was mandated by the Office of the Assistant Secretary of the Army. Under this initiative, Army contractors are required to report all manpower (including subcontractor manpower) necessary for performance of their contract into the Office of the Assistant Secretary of the Army's secure data collection site at https://contractormanpower.army.pentagon.mil. This requirement applies to every contractor performing contracting services at a value of $25,000.00 or greater, where an Army organization is receiving or benefiting from the services. Offerors who submit proposals under this BAA that are selected for and negotiated to a contract award benefiting the Army will be required to submit their manpower into this database. The required reporting period will be the contract period of performance - not to exceed twelve (12) months - ending 30 September of each government fiscal year and must be reported by 31 October of each calendar year. Further specifics on this will be incorporated into contract award documents. Offerors are encouraged to go to the website set forth in this paragraph to familiarize themselves more with this initiative.

SECTION IV - EVALUATION PROCESS

EVALUATION APPROACH FOR CONCEPT PAPERS

Concept papers will be evaluated by technical/scientific personnel that are knowledgeable within the particular topical area/specific interest area to determine if the paper presented is consistent with the intent of the BAA and is of interest to the government. Concept papers will be evaluated on the scientific/technical merit, the management approach, the importance to agency programs, and the proposed cost/price. Based on these evaluation criteria, the highest rated concept papers will show considerable potential to develop into highly qualified proposals that could likely lead to an award. Concept papers will be evaluated within ninety (90) days of receipt.

EVALUATION APPROACH FOR PROPOSALS

a. Proposals submitted in response to this solicitation will be given a scientific/peer review evaluation by NSC technical personnel in accordance with below evaluation criteria within ninety (90) days after receipt. Each proposal will be evaluated based on the merit and relevance of the specific proposal as it relates to NSC program requirements/needs, rather than against other proposals. Once a proposal has been submitted by the technical POC to the contracting office the contractor is to HAVE NO FURTHER CONTACT with the technical POC until the time a contract award exists. Inquiries regarding status of the evaluation may be addressed to the administrative POC indicated under each scientific and technical area.

b. Offerors whose proposals are considered not to have sufficient merit, which are not relevant to an Army need, or which are in areas where funds are not expected to be available, will be notified as soon as possible after completion of evaluation that their proposal will not be further considered for a contract award.

c. For those proposals that are acceptable, notification will be made within ninety (90) days after receipt of proposal. The offeror will also be notified as to if and when funding is expected to be available for the project. The offeror is cautioned that the availability of funds as of the date of such notice is no guarantee that funds will be available at any given later date.

BASIS FOR AWARD

Offers will be selected based upon the outcome of proposal evaluation in accordance with the evaluation criteria cited below, plus the availability and source of funds. Not all highly rated proposals will result in a contract award. The government may elect not to award a contract for every highly rated proposal for each topical area/specific interest area. The government may award more than one contract in a given topical area/specific interest area, or the government may not award a contract at all in a given topical area/specific interest area.

FACTORS AND SUBFACTORS TO BE EVALUATED

Evaluation will be broken down into four (4) factors: technical, management, cost/price, and past performance. The technical factor is the most important followed by management, cost/price, and, finally, past performance. The technical factor has at least two (2) and up to three (3) subfactors, and cost/price has two (2) subfactors, each of equal importance. Technical subfactors A and B are of equal importance, and subfactor C is also equal when it is an applicable subfactor. Technical, management, and past performance, when combined, are significantly more important than cost/price.

Technical personnel will assign an adjectival and risk rating for the technical and cost/price factor and subfactors, as well as the management factor of each proposal. Past performance areas will receive only a performance risk rating.

EVALUATION CRITERIA

a. FACTOR I - Technical: Each subfactor in this factor will be evaluated and will receive an individual rating. This factor will receive an overall rating based on the ratings of all the technical subfactors combined.

(1) Subfactor A: Technical Merit: The proposal will be evaluated on the relevance of the proposed effort in response to the topical area/specific interest area and the overall technical feasibility of the technology, capability, the product and/or the technology proposed.

(2) Subfactor B: Technology Advancement/Warfighting Capability: The proposal will be evaluated on the potential to increase the combat effectiveness of the Army and the potential for exploiting a capability not likely to be executed elsewhere.

(3) Subfactor C: Safety and MANPRINT Requirements (when applicable): The proposal will be evaluated to assure that it has properly addressed safety/MANPRINT requirements (see section V herein) by including the following information:

(a) The offeror's understanding of safety/MANPRINT and how it applies to the proposed work.

(b) What methods/techniques will be used to ensure that safety/MANPRINT will be incorporated into the program so as to ensure that the items/product delivered to the government are safe and effective for use by personnel

(c) The qualification/knowledge of the individual responsible for the offeror's safety/MANPRINT requirements.

b. FACTOR II - Management:

The proposal will be evaluated on the quality of the personnel, equipment, facilities, project management systems, controls (i.e., the overall organization) and the milestone schedule being proposed. The overall management plan will be evaluated.

c. FACTOR III - Cost/Price: Each subfactor in this factor will be evaluated and will receive an individual rating. This factor will receive an overall rating based on the ratings of both cost/price subfactors combined.

(1) Subfactor A: Cost/Price Benefit: The proposals will be evaluated to determine the overall benefit to the government. Considerations will include industry contribution and fiscal feasibility. Fiscal feasibility includes the ability to accomplish the proposed project within government fiscal constraints, and includes the requirement for the use of other government contractors to assist in the execution of proposed effort, and the use of government furnished equipment, information, facilities, and other assets. The proposals will be evaluated to determine the extent to which the overall cost/price to the government is reasonable.

(2) Subfactor B: Cost/Price Realism: The proposals will be evaluated for cost realism to assess the likelihood that the technical and management approaches can be accomplished at the cost/price proposed.

d. FACTOR IV: Past Performance: The offeror's and first tier subcontractor's past performance with government and industry in the specific interest area or similar and/or related areas will be evaluated to assess the relative risks associated with the offeror's likelihood of success in meeting the requirements stated in this BAA. Specific areas of past experience and performance examined will include demonstrated technical and schedule performance, cost control, general responsiveness to contract requirements, customer satisfaction, and customer focus. Emphasis will be on recent, relevant experience (see past performance area under section II of this BAA).

RATING METHOD

a. Under the technical portion in the MANPRINT/safety evaluation only, the following method shall be used: the offer will be given a pass/marginal/fail in the evaluation areas cited, however, should a fail or marginal be given, the government may be able to work with the offeror in order to assure MANPRINT/safety requirements are correctly addressed

b. Adjectival Ratings: The adjectival ratings that will be utilized for evaluating individual technical, management, and cost/price factors and subfactors are defined as follows:

(1) Excellent: Evaluation of the factor/subfactor indicates the offeror's proposal meets or exceeds all stated criteria by demonstrating a firm grasp of the requirements and translating the requirements into a well defined and preferred approach. Innovative approaches that push the state of the art are present. The proposal exhibits strengths, and does not contain any weaknesses or deficiencies.

(2) Very Good: Evaluation of the factor/subfactor indicates the offeror's proposal meets or exceeds all stated criteria by demonstrating an understanding of the requirements and translating the requirements into a well defined and feasible approach. Innovative approaches that are, at a minimum, state of the art, are present. The proposal exhibits some strengths and might contain one or more weaknesses but does not contain any deficiencies.

(3) Acceptable: Evaluation of the factor/subfactor indicates the offeror's proposal meets all stated criteria by demonstrating an understanding of the requirements and translating the requirements into a feasible approach. Limited innovation beyond the

norm is present. The proposal may exhibit some strengths and might contain some weaknesses but does not contain any deficiencies.

(4) Marginal: Evaluation of the factor/subfactor indicates the offeror's proposal meets the majority of the stated criteria but either demonstrates a limited understanding of the requirements or translates the requirements in an approach which may not be feasible. The proposal may exhibit some strengths and might contain several weaknesses but does not contain any deficiencies.

(5) Unacceptable: Evaluation of the factor/subfactor indicates the offeror's proposal does not meet the stated criteria or contains one or more deficiencies which indicate a lack of understanding of the requirements. The stated criteria can only be met with major changes to the proposal.

c. Risk Assessment:

(1) The proposal risk assessment ratings for technical, management, and cost/price factors and subfactors are defined as follows:

(a) High: Likely to cause serious disruption of contract effort or increase in cost/price of performance even with special contractor emphasis and government monitoring.

(b) Moderate: Has some potential to cause minor disruption of contract effort or increase in cost/price of performance. Normal government monitoring will probably be able to overcome most difficulties.

(c) Low: Has very little potential to cause disruption of contract effort or increase in cost/price of performance. Minimal government monitoring will probably be able to overcome difficulties.

(2) The performance risk assessment ratings for past performance are defined as follows:

(a) High: Based on the offeror's performance record, substantial doubt exists that the offeror will successfully perform the required effort.

(b) Moderate: Based on the offeror's performance record, some doubt exists that the offeror will successfully perform the required effort.

(c) Low: Based on the offeror's performance record, little doubt exists that the offeror will successfully perform the required effort.

(d) Unknown: No performance record identifiable. This is essentially a neutral rating, which will neither directly benefit nor negatively impact the offeror.

d. Definitions:

(1) **Strength:** An aspect of a proposal that appreciably decreases the risk of unsuccessful contract performance or that represents a significant benefit to the government.

(2) **Weakness:** A flaw in the proposal that increases the risk of unsuccessful contract performance. A "significant weakness" in the proposal is a flaw that appreciably increases the risk of unsuccessful contract performance.

(3) **Deficiency:** A material failure of a proposal to meet a government requirement or a combination of significant weaknesses in a proposal that increases the risk of unsuccessful contract performance to an unacceptable level.

SECTION V - SAFETY AND MANPRINT REQUIREMENTS

In addition to the technical portion of your proposal, there are specific requirements for Safety and MANPRINT (MANpower and PeRsonnel INTegration)/Human Systems Integration (HSI) that are governed by regulation which must be included, ***if applicable***, in any acceptable proposal. Contractors who develop an item, equipment or system for use by U.S. Army personnel shall include the following system safety/health hazards and MANPRINT requirements:

1. SYSTEM SAFETY/HEALTH HAZARD

Contractors who propose development of early technology or prototype materiel shall ensure an aspect of their effort is to identify potential mishap risks and that those risks are eliminated or controlled to an acceptable level. The objective of this effort is to preclude injury, illness, death to the user or maintainer or damage to the materiel developed. To ensure this objective the contractor should describe their planned actions, may be required to conduct specific hazard analyzes, and provide a safety assessment that:

identifies safety design standards (statutory, regulatory, industry consensus, etc.) utilized in their design,
identifies safety features, controls, devices, etc., incorporated into their materiel design,
includes Material Safety Data Sheets for potentially hazardous materials used in the manufacture or operation of the materiel,
residual risks associated with the use of the materiel, AND
specific safety recommendations or precautions required to ensure the safety of personnel and property

Acceptable levels of residual risk, and combined hazard severity-probability (Risk Assessment Code), are provided below for the convenience of potential offerors. These "excerpts" were taken from MIL-STD-882D, Standard Practice for System Safety, which, if desired, may be seen in full text at the following web site: http://www.geia.org/sstc/G48/882d.pdf.

a. Risk Assessment: Decisions regarding resolution of identified hazards shall be based upon assessment of the residual risk involved. To aid the achievement of the objectives of system safety, hazards shall be characterized as to hazard severity categories and hazard probability levels, whenever possible. A risk assessment procedure considering only hazard severity will generally suffice during the early design phase to minimize risk. When hazards are not eliminated during the early design phase, a risk assessment procedure based upon hazard probability hazard, hazard severity, as well as risk impact shall be used to establish priorities for corrective action of identified hazards or formal acceptance of residual risks.

Table 1 Risk Assessment Codes (RACs)

			PROBABILITY				
			Frequent A	Probable B	Occasional C	Remote D	Improbable E
SEVERITY	Catastrophic	I	IA	IB	IC	ID	IE
	Critical	II	IIA	IIB	IIC	IID	IIE
	Marginal	III	IIIA	IIIB	IIIC	IIID	IIIE
	Negligible	IV	IVA	IVB	IVC	IVD	IVE

Table 2 Risk Levels Indicated by RACs

HAZARD RAC	RISK LEVEL
IA-ID, IIA-IIC, IIIA	**HIGH** – Unacceptable
IE, IID, IIIB-IIIC, IVA	**MEDIUM** – Unacceptable
IIE, IIID-IIIE, IVB-IVE	**LOW** - Acceptable upon review & approval of System Safety PM/Project Officer & Supporting Engineer

b. Hazard Severity: Hazard severity categories are defined to provide a qualitative measure of the worst credible mishap resulting from personnel error; environmental conditions; design inadequacies; procedural deficiencies; or system, subsystem, or component failure or malfunction.

Table 3 Hazard Severity Definitions

DESCRIPTION	CATEGORY	DEFINITION
Catastrophic	I	Death or system loss
Critical	II	Severe injury, severe occupational illness, or major system damage
Marginal	III	Minor injury, minor occupational illness, or minor system damage
Negligible	IV	Less than minor injury, occupational illness or minor system damage

c. Hazard Probability: The probability that a hazard will be created during the planned life expectancy of the system can be described in potential occurrences per unit of time, events, population, items, or activity. Assigning a quantitative hazard probability to a

potential design or procedural hazard is generally not possible early in the design process. A qualitative hazard probability may be derived from research, analysis, and evaluation of historical safety data from similar systems. Supporting rationale for assigning a hazard probability shall be documented in hazard analysis reports. An example of a qualitative hazard probability ranking is:

Table 4 Hazard Probability Definitions

DESCRIPTION*	LEVEL	SPECIFIED INDIVIDUAL ITEM	FLEET OR INVENTORY**
Frequent	A	Likely to occur frequently	Continuously experienced
Probable	B	Will occur several time in the life of an item	Will occur frequently
Occasional	C	Likely to occur some time in the life of an item	Will occur several times
Remote	D	Unlikely, but possible to occur in the life on an item	Unlikely, but can be reasonably expected to occur
Improbable	E	So unlikely, it can be assumed occurrence may not be experienced	Unlikely to occur, but possible

* Definitions of the descriptive words may have to be modified based upon quantity involved.
** The size of the fleet or inventory should be defined.

2. MANPRINT

MANPRINT is a comprehensive management and technical process designed to improve total system (user, hardware and software) performance through continuous integration of manpower, personnel, training, human factors, system safety, health hazards, and soldier survivability considerations throughout the materiel design, development, and acquisition process. MANPRINT concerns which must be addressed during the performance of tasks are focused primarily on optimizing user/maintainer performance while minimizing error and simplifying maintenance tasks, without introducing any new safety risks or health hazards. To ensure that this objective is met, if applicable, all developmental efforts shall include MANPRINT/Human Factors Engineering analyses which identify and evaluate operability and maintainability deficiencies.

Early discussions with appropriate POCs will identify whether or not MANPRINT requirements apply to a particular effort. Typically, MANPRINT applies to the design, development, and acquisition of all items, equipment, or systems intended for personnel use or will require personnel interaction for the proper use, maintenance, repair, etc. These items include, but are not limited to typical soldier products under the purview of Natick Soldier Center, such as: personal protective clothing/equipment, food and food service equipment, tents/shelters and airdrop equipment. For efforts focused on research, MANPRINT considerations, particularly those associated with safety and health hazards,

shall apply when the product of a research effort will be utilized in the development of items, equipment, or systems. Specifically, contractors shall consider the potential safety and health hazards implications that the products of their research efforts will have when/if those products are integrated into items. When MANPRINT is required, it shall be addressed in the contractor's proposal under the technical section and will be evaluated under the technical section as outlined in Section IV of this BAA.

For efforts requiring MANPRINT considerations, the contractor shall provide documentation that should include, as appropriate to the proposal (but is not limited to) an explanation which describes how each MANPRINT domain was (or will be) taken into consideration when designing/developing the item. Include a discussion relating to the trade-offs that were made, if any, and the rationale associated with those trade-offs and/or how trade-offs associated with the MANPRINT domains will be addressed and handled. Specifically, the contractor shall address each domain regarding the proper use/operation, maintenance, inspections and repair of their product, as follows:

(1) Manpower/Personnel & Training: Address the numbers of personnel, their skill qualifications and training (either in the form of formal training, embedded training, training materials, etc.) that is or will be required.

(2) Human Factors Engineering:

(a) Describe how sound human factors engineering principles and practices were (or will be) applied to the design and development of the product.

(b) The contractor shall utilize the data for design-critical human body dimensions as contained in the 1988 Anthropometric Survey of U.S. Army Personnel: Methods and Summary Statistics. Address what design-critical human body dimensions were (or will be) taken into consideration when designing the product (e.g., for proper fit of items or acceptable reach/accessibility, etc.).

(c) When deemed appropriate, provide the following Human Factors Engineering analysis or the intention to provide this information:

Explanation which documents and describes human performance errors and/or difficulties which may be encountered during operation, maintenance, and repair of the item, equipment, or system. For each error include the estimated frequency of occurrence, the cause of the error/difficulty in terms of the conditions which may have contributed to it, the consequence of the error/difficulty on system operation, and a brief explanation of the reason for the error/difficulty by the user.

Explanation which describes how human performance may impact system goals by including a narrative explanation of how human error associated with operations, and the length of time required to perform operations, may affect system reliability and effectiveness.

A description of potential incompatibilities among human performance capabilities and equipment to document both the aspects of performance which may be adversely affected, and the associated equipment configurations/characteristics. The contractor shall identify the controls or

displays that may be needed, but are not present on the equipment. Recommended solutions to these incompatibilities shall also be included and stated in terms of redesign, alteration of tasks and/or training.

(d) Provide any instructions necessary for proper use/ operation/ maintenance/ repair of the equipment or a discussion of what instructions will be developed or will be necessary. The instructions shall include the proper method of interface with any other standard item that will typically be used/worn with their product.

(3) System Safety and Health Hazards: see section V, paragraph 1

(4) Soldier Survivability: Soldier Survivability pertains to the characteristics of a system that can reduce fratricide, detectability and probability of being attacked, as well as minimize system damage, soldier injury, and cognitive and physical fatigue. Describe any impacts the product has on Soldier Survivability and/or how Soldier Survivability issues were (or will be) considered in the design/development of the product.

c. All contractor questions/concerns about safety and MANPRINT requirements may be discussed with the following appropriate POCs:

Safety: Mr. Dan Gregory, TEL: 508-233-4883, dan.gregory@natick.army.mil
MANPRINT: Ms. Rose Guerra, TEL: 508-233-4070, rose.guerra@natick.army.mil

SECTION VI - SCIENTIFIC AND TECHNICAL AREAS OF INTEREST

There are ten (10) major areas of interest, each categorized into more specific areas of interest.

A. COMBAT FEEDING EQUIPMENT AND SYSTEMS.

1. Combat Food Service Equipment for Individual and Group Feeding.

Ideas, concepts, and technologies applicable to sustaining troops on the battlefield are needed for four general mission areas: consolidated large groups (550 troops), companies (150 troops), squads (12 troops), and individual warfighters. Responsive proposals are directed towards minimizing the expenditure of energy, manpower, and other resources and materiel, and yet provide maximum flexibility and effectiveness in responding to the total food service requirements of troops operating under all battlefield threats, in all climatic and terrain conditions, and at all levels of commitment. Generally, the requirements are for systems that can be rapidly deployed/employed; are easily transported; offer quick response times; are highly efficient (i.e., require least manpower, fuel, water, etc.); support all types of rations and menus; and, can be readily adapted to any battlefield scenario. As such, equipment must be compact, lightweight, versatile (e.g., modular, multi-functional, multifuel capability, etc.), energy efficient, reliable, and easily operated and maintained. In addition, effective field sanitation and waste handling/disposal concepts are needed.

Field feeding equipment and systems can be classified according to the following specific interest areas:

(a) Individual

(1) Ration and beverage heating

(2) Ration and beverage chilling

(b) Group

(1) Heat and Serve

(2) Storage of perishable fresh and frozen foods

(3) Preparation of meals

(4) Transportation, distribution, and service

(5) Waste management, reduction, recycling, and conversion

(6) Sanitation

(7) Refrigeration

<u>Scientific and Technical Areas of Interest</u>:

A comparison of current and emerging capabilities versus known and projected requirements of the Military Services indicate an interest in the following technical areas:

a. Diesel/JP8 combustion technologies including vaporization, atomization, and gasification (catalytic or otherwise) that are efficient, clean, reliable, and maintainable.

b. Exothermic and endothermic chemical technologies and thermoelectric technologies for heating and chilling rations/beverages that are safe, efficient, compact and/or reusable.

c. Heat transfer technologies that will safely utilize all forms of generated/cogenerated energy (e.g., chemical, electrical, fuel combustion, etc.) for cooking, heating and cooling rations and water.

d. Refrigeration technologies, or other methods for safely storing perishable foods, that operate with minimum expenditure of energy and limited weight/space demands for all modes of transport, storage, and distribution of perishable subsistence in the field.

e. Equipment technologies for safely thawing cases and pallets of frozen foods.

f. Methods and equipment to determine real-time biohazards in foods.

e. Material technologies for new structural and insulative materials appropriate for food service equipment that provide improved durability, strength, energy efficiency, and cost.

f. Equipment and systems technologies to reduce or recycle food service waste and/or to assist in efficient, safe waste handling and disposal in the field in an environmentally acceptable manner.

g. Equipment technologies to ensure the sanitary protection of food and beverages during assembly, preparation, service, and distribution in the field, and systems concepts for efficient and effective cleaning and sanitation of field feeding equipment.

h. Novel power supplies for efficiently and effectively producing/storing, and/or providing electric power to operate field feeding equipment, including consideration of such factors as size, weight, cost, reliability, safety, maintainability, useful life, and environmental factors.

i. Equipment technologies, novel methods, and devices for heating food and chilling water on aircraft and in vehicles.

j. Equipment technologies that offer improvements in baking, roasting, steaming, boiling, simmering, and grilling.

k. Equipment and technologies to reduce cooking, cleaning, and maintenance labor in Navy ship galleys.

l. Automated Information Systems, Radio Frequency Identification, and sensors for food service equipment and systems to include wireless systems that support more efficient and effective food service operations

Communication with the Technical POC prior to submission of a formal proposal is highly recommended.

Technical POC:

Mr. Don Pickard, TEL: 508-233-5036, don.pickard@natick.army.mil

All concept papers, proposals and administrative inquiries should be submitted to:

U.S. Army Soldier Systems Center
Natick Soldier Center
ATTN: AMSRD-NSC-CF-D/Anne Sowerbutts
Kansas Street
Natick MA 01760-5018
TEL: 508-233-5031, anne.sowerbutts@natick.army.mil

2. Unit/Organization Equipment.

Unit/organizational and field service support equipment are required to sustain and increase the efficiency, survivability, and operational capability of the soldier in the battlefield while meeting individual needs. Equipment required to perform a variety of field functions must be efficient, reliable, compact, lightweight, easily operated /maintained, and logistically supportable. This equipment must also be rugged enough to withstand field transport, set-up under high stress conditions, repeated set-up and tear down, and drastically varying field conditions and climates. Future battlefield requirements dictate the need for more mobile, NBC survivable and multi-functional equipment in addition to the need to reduce the logistical burden of supplying water, fuel, and electrical power to the field.

Specific interest areas include:

a. Mobile Laundry Systems
b. Space Heaters for Tentage and Shelters
c. Water Heaters for Laundry, Showers, and General Purpose Hot Water (Including non-powered immersion type heaters)
d. Field Clothing and Textile Repair Equipment
e. Field Sanitation and Hygiene Equipment
f. Non-Powered Field Lighting
g. Mortuary Affairs Equipment
h. Latrines and Incinerators for Human Waste Collection and Disposal in the Field
i. Lightweight portable shower systems
j. Field furniture
k. Portable Field Waste Water Treatment/Recycling Systems
l. Co/tri-generation technologies

<u>Scientific and Technical Areas of Interest</u>:

A comparison of current capabilities versus future combat service support requirements dictates interest in the following major areas of scientific knowledge and technological capabilities:

a. Advanced technology to allow the exploratory development of diesel/jet fuel-fired clothes dryers, microwave clothes dryers, and water heaters suitable for field use.

b. Advanced combustion technology to allow the exploratory development of clean-burning, efficient, and safe multi-fuel fired non-powered heaters for the field. This includes both space heaters and immersion heaters for water. ("Non-powered" means that no external electrical power is required for operation.)

c. Advanced technology to allow the exploratory development of photocopy equipment suitable for field use, with high reliability and low maintenance support requirements.

d. Environmentally safe dry-cleaning solvents which are compatible with Army clothing and finishes.

e. Advanced water treatment technologies to allow the safe re-use or disposal of waste water from field showers, laundries, and latrines.

f. Technology to produce low-cost, high efficiency, lightweight equipment for heating, ventilating, uniform heated/cooled air distribution, and conditioning for tentage applications (including collective protection).

g. Novel and exploratory concepts to effectively and reliably identify, process, and safely transport (including air transport) NBC contaminated human remains from the NBC battlefield.

h. Novel and exploratory concepts to provide non-powered field lighting using liquid fuels such as diesel and jet fuel.

i. Advanced small capacity multi-fuel combustion, heat transfer, and material technologies to allow development of lightweight highly portable general purpose hot water heaters for field use.

j. Advance technologies to permit the development of advancement of equipment identified in the functional areas above to better the quality of life for the soldier in the field.

k. Advanced laundry technologies for reducing the use of detergents and water over existing systems.

l. Advanced technology for the development of lightweight, modular, deployable field latrines and advanced methods of treatment and disposal for waste human from latrines in the field.

m. Advanced technology for developing a lightweight, portable incinerator that will provide a safe, economical, and environmentally sound means of disposing of waste products (including human wastes) generated during military operations.

n. Advanced technology to allow development of compact, portable, lightweight shower units for use by soldiers on initial entry into theaters of operation.

o. Novel means of power generation (thermoelectric, thermophotovoltaics, solar, etc) to allow field service equipment such as heaters, showers and laundries, to be self-powered for operation in remote/isolated locations w/o need of tactical generators.

p. Novel concepts in field furniture that will reduce the logistics burden, be easily deployable and lightweight, rugged, and enhance utility/effectiveness in the field.

q. Novel waterless or low water cleansing technologies for field showers and personal hygiene.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC:
Mr. Joseph Mackoul, TEL: 508-233-5592, joseph.mackoul@natick.army.mil

All concept papers, proposals and administrative inquiries should be submitted to:

U.S. Army Soldier Systems Center
Natick Soldier Center
ATTN: AMSSB-PM-RSS-F(N) (Mr. Joseph Mackoul)
Kansas Street
Natick, MA 01760-5057
TEL: 508-233-5592, joseph.mackoul@natick.army.mil

B. COMBAT RATION RESEARCH AND DEVELOPMENT.

Shelf-stable prepared combat rations are essential for enabling the individual Warfighter to perform assigned missions and to survive battlefield threats. The requirements for compactness, storage stability; protection; modularity; enhanced nutrition, acceptance, convenience; and producability have become even more stringent in anticipation of supporting highly mobile, widely dispersed Warfighters in climatic extremes.

Combat ration functionality goals can be divided into the following specific interest areas:

- Storage stability with maximum quality and nutrient retention
- Production and distribution efficiency
- Consumption/acceptance enhancement
- Human performance maintenance/enhancement
- Improved and more effective protective packaging systems
- Food Safety

Scientific and Technical Areas of Interest:

A comparison of current capabilities versus future battlefield requirements indicates the need to explore certain new areas of scientific knowledge and technological capabilities. These Scientific and Technical (S&T) Areas of Interest are in direct support of several operational/capability requirements defining the needs of the Armed Services on the future

battlefield (Future Force). The S&T Areas of Interest also support the Army Science and Technology Objective: Nutritionally Optimized First Strike Ration, which has the following main thrusts: enhanced performance; energy and nutrient intake; improved consumption rates; and reduced ration weight, source material, and waste. In addition, each S&T area is linked to Joint Vision 2020, the Joint Operational Concepts, and the Services visionary documents to provide the total spectrum of joint service support to sustain the warfighter and his/her combat system on the battlefield of the future with focused logistics, improved responsiveness, deployability, agility, versatility, survivability, and sustainability. The spectrum of likely operations describes a need for land forces in joint, combined, and multinational formations for a variety of missions extending from humanitarian assistance and disaster relief to peacekeeping and peacemaking to major theater wars.

Advanced and efficient protective packaging systems are crucial to the preservation of Army material in any climatic and/or hazardous environment. Material requirements for protective packaging systems relate to both food and food service equipment. In order for the individual soldier to perform the assigned mission and/or survive battlefield threats, the mission essential item must arrive at the right time, at the right place and provide the expected functionality and utility. Technological advances in high barrier polymer films and coatings, and active packaging are needed to meet the increasingly stringent and sometimes conflicting requirements of compactness, storage, protection, modularity, durability, convenience, degradability, and producability. Packaging functionality includes (as applicable) protection from the following concerns: temperature extremes, insect/rodents, moisture permeation, oxygen permeation, light penetration, microbial penetration, and transportation hazards (including Air Drop). Advanced systems for tracking and monitoring quality of ration unit loads are required for flexible logistic systems for the future battlefield.

The key areas of science and technology include:

a. Scientific information and advanced processing technologies are needed to ensure that nutrients required for optimum performance under stress are provided and are physiologically available for utilization.

b. Improved technology is needed to produce lightweight, low-volume, nutrient/calorie-rich ration components that would be cost effective and producible by industry.

c. Innovative food processing technologies and systems are needed to provide for cost effective, high volume production of shelf stable fresh-like wet or intermediate moisture foods with maximum retention of quality factors and nutrition.

d. Scientific information about the influence of food constituents and processing (traditional and novel advanced methods), on the physical structure, chemical reactivity, nutrient preservation, package integrity, and microbiological safety of ration components is needed to ensure their stability under extreme storage conditions (with special interest in dairy products, eggs and other high-protein foods.

e. Scientific information/innovative technologies on extending shelf-life/storage stability of fresh fruits and vegetables and logistical support mechanisms suggested for viable technologies.

f. Programming and data base development for exploiting on soldier computers a ration item optimization model to guide the selection of ration items or off-the-shelf items for different missions based on energy requirements, nutritional content, battlefield climate/conditions, personal preferences, weight, volume, and cost of items or components.

g. Scientific information on the basis for and extent to which, specific food constituents incorporated into the food: 1) delay fatigue, 2) extend physical strength and endurance or 3) heighten alertness or enhance cognitive abilities of warfighters engaged in physically or mentally demanding tasks.

h. Scientific concepts and data are required for increasing the speed and sensitivity of detection technologies (sensors) for food safety determination, to include novel approaches in preparation of samples from complex food matrices, high throughput screening capabilities, improved transducer technologies and capture efficiencies. In addition field portable objective and quantitative technologies are required for determination/estimation of ration quality status.

i. Packaging technology based on non-foil high barrier polymeric material is needed to ensure protection against oxygen, moisture vapor, microbial, and insect penetrants to maintain integrity throughout the military logistics system, and to provide rations with a minimum three year shelf life.

j. Technology is needed to develop smart packaging materials/films/coatings or adjuvants possessing inherent properties for absorbing or eliminating moisture, oxygen, off odors (e.g. aldehydes), carbon dioxide, and/or ethylene. Also, develop materials containing anti-microbial agents, physiological inhibitors for fresh produce and other methodologies to control or modify the atmosphere within the package for extension of shelf life.

k. Technology is needed to develop advanced materials/films/coatings for flexible and semi-rigid polymeric containers that provide physical and chemical protection comparable to traditional aluminum foil-based high barrier polymeric materials. Determine compatibility of non-foil high barrier polymeric material for both thermoprocessing and novel thermal/nonthermal processing.

l. Technology is needed to improve packaging to make it more recoverable, recyclable, degradable and capable of being decontaminated.

m. Technology, including enhanced bar code labels, integrated Radio Frequency (RF) tags with and without environmental sensors, Application Specific Integrated Circuit (ASIC) and/or Nanoblock based chips for RF tags, improvements to RF signal absorption of rations and Electronic Product Code (EPC) compliant architectural modeling schemes, is needed to enhance secondary ration packaging systems to improve strategic handling, assembly, mobility, deployability, transportability, security, logistics tracking, and retrieval.

n. Technology is needed to develop cost effective, easy-to-open, or reclosable, functional packages for dispensing both conventional and unconventional solid and reconstituted liquid ration components.

o. Technology is needed to develop flexible or semi-rigid high barrier materials that are compatible with Horizontal/Form/Fill/Seal machinery, capable of withstanding classical thermoprocessing or microwave, radio frequency or high pressure sterilization as well as aseptic packaging and capable of providing products with a three year shelf life.

Communication with the technical POC prior to submission of a formal proposal is essential.

Technical POC:
Dr. C. Patrick Dunne, TEL: 508-233-5514, patrick.dunne@natick.army.mil

All concept papers, proposals and administrative inquiries should be submitted to:

U.S. Army Soldier Systems Center
Natick Soldier Center
ATTN: AMSRD-NSC-CF-D/Anne Sowerbutts
Kansas Street
Natick MA 01760-5018
TEL: 508-233-5031, anne.sowerbutts@natick.army.mil

C. WARRIOR SYSTEMS TECHNOLOGIES.

1. Ballistic Protection for Individuals

Ballistic protection for the individual soldier involves protection of the body (head/neck, torso, extremities) against a variety of projectiles that differ widely in shape, size and impacting velocity. New materials and systems are required to meet these broad ballistic threats and to lighten the load carried by the Soldier.

Scientific and Technological Areas of Interest:

A comparison of current capabilities versus future battlefield requirements dictates interest in the following major areas of scientific knowledge and technological capabilities.

Technology is needed for:

a. New polymers that can provide increased tensile properties, increased ballistic protection and lighter weight.
b. Highly ordered polymers e.g. liquid crystals, for High Performance (HP) fibers.
c. Improvements to existing HP fibers (e.g., surface modification, processing and composition variations)

A need also exists for:

d. Novel concepts to identify the best technical approach to provide protection to the individual Soldier against multiple ballistic threats. Such concepts should identify ballistic

defeat mechanisms for fragmentation and handgun threats. Upon identification of and understanding defeat mechanisms, further efforts should establish the feasibility of systematically combining those mechanisms into lightweight, flexible, minimum-bulk structures of 1 lb per square foot or less providing a high level of protection against the identified threats.

e. Unique and novel textile and composite structures which optimize the ballistic protection of currently available materials for soft body armor and helmet applications.

f. Studies of blast effects to include overpressure and behind armor effects on the individual and materials/systems to mitigate effects.

g. Novel concepts to identify the best technical approach to provide ballistic protection to the individual Soldier against multiple ballistic threats. Such concepts should identify ballistic defeat mechanisms for current ballistic threats including small arms threats and flechettes. The small arms threats range from 5.45mm to 7.62mm ball and armor piercing (AP) with limited interest in 12.7 mm AP. Upon identification of defeat mechanisms, further efforts should establish the feasibility of systematically combining those mechanisms into lightweight, minimum-bulk structures using unique and novel textile and/or composite systems.

h. Additional concepts may include transparent armor, smart materials for armor and other functionalities, and nanotechnology approaches to new materials.

Some of the technical approaches for topics within this solicitation may be subject to export control restrictions under existing export control laws, and or required to be conducted as classified projects as outlined in the National Industrial Security Program Operating Manual (NISPOM) and its supplements. Contractors who would like to submit proposals pertaining to such technologies are encouraged to contact their local Defense Investigative Service (DIS) Industrial Security representative or the Technical POC listed in the solicitation for guidance.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC:
Ms. Janet Ward, TEL: 508-233-5462, janet.ward@natick.army.mil

All concept papers, proposals and administrative inquiries should be submitted to:

U.S. Army Soldier Systems Center
Natick Soldier Center
ATTN: AMSRD-NSC-IP-D/Ms. Heather Parker
Kansas Street
Natick, MA 01760-5019
508-233-4929, heather.parker@natick.army.mil

2. Integrated Protective Helmet.

Head borne protection for the individual combatant involves protection of the head (to include the eyes and neck) against fragmentation munitions, handgun projectiles and blunt trauma impact. New materials, designs and technologies are required to meet these broad range of threats while also providing the appropriate ergonomics, comfort, hearing and cooling necessary for the individual to be capable of wearing the head protection for extended periods of time.

Scientific and Technological Areas of Interest:

A comparison of current capabilities versus future battlefield requirements dictates interest in the following major areas of scientific knowledge and technological capabilities.

Technology is needed for:

a. New and improved polymers for fiber reinforced plastics and resins which can provide increased ballistic protection and lighter weight.

b. New fibers and materials for energy absorption and moisture vapor permeability/cooling management.

c. Transparent materials for enhanced eye protection without reductions in visibility.

d. Improved lightweight integrated communications devices.

e. Engineering designs which incorporate enhancements to combat helmets including area of coverage, field of view, modular attachment points, speech recognition, compatibility with existing equipment and improved hearing capabilities.

A need also exists for:

f. Novel modular designs and integration concepts to identify the best technical approach to provide head protection to the individual combatant against multiple ballistic and non-ballistic threats. Such concepts should identify ballistic protection capabilities for each component and area of the head to be protected. Upon identification of critical design elements further efforts should establish the feasibility of systematically combining those modular components into a lightweight head borne system of approximately 3.5 pounds providing a high level of protection against the identified threats and high level of user comfort.

g. Unique and novel design approaches, which utilize the currently fielded Marine Corps Lightweight Helmet as a base platform for incorporating modular components for improved ballistic/blast protection and would offer the user the ability to tailor the level of protection to the current threat by adding or removing modular integrated components (i.e. face shield, eye protection, neck protection).

h. Unique and novel design approaches for protective assemblies, which provide maximum area of coverage and ballistic resistance capabilities. These systems could weigh as much as 8 –12 pounds and encompass the entire head. This type of approach will require attachment designs and bio-mechanic studies to determine the best means for carrying the system weight on the shoulders or other parts of the body and be capable of allowing the user to tailor the level of protection to the anticipated threat by adding or removing modular integrated components.

i. Ergonomic and human factor studies to identify key parameters for user acceptability. The identified design(s) include studies, laboratory data and human evaluations for heat stress retention, stability, ability to fire weapon systems, maneuverability and general form, fit and function of proposed design.

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3. Chemical/Biological Protection for Individuals.

The protection of the Soldier from exposure to hazardous chemicals, such as chemical warfare agents, is essential to mission accomplishment on today's battlefield and that of the future. This protection is currently accomplished through the use of an activated carbon system, the use of semi-permeable material systems, and the use of impermeable barrier materials. The activated carbon system is used in protective overgarments and affords protection by adsorbing hazardous chemicals. The impermeable barrier materials consist of rubber, coated, and multilayer laminate fabrics found in gloves, boots and special purpose (e.g. depot storage /demolition/explosive ordnance disposal ensembles), which afford protection by acting as a physical barrier to chemicals.

Future needs for chemical-protective uniforms require that they protect against multiple threats, including toxic aerosols and biological agents, be decontaminable and reusable. These uniforms must also be comfortable in all climates and not impair the mobility or performance of the Soldier. The materials for these uniforms should be lightweight, have improved protection for resistance to liquid, vapor, and aerosol CB agent penetration, lessen the propensity for heat stress, have increased durability and shelf life, and be reusable through the use of reactive and biocidal materials that will detoxify the chemical warfare (CW) agents without adverse reaction with the skin. There is a need for the development of methods for measuring adsorption of agents and agent surrogates within protective materials (particularly liquid challenge/liquid penetration) and for determining the reaction products (quantitative and qualitative) that originate from detoxification chemistry taking place in catalytic and reactive materials.

A need also exists to mitigate the effects of heat stress induced by chemical protective clothing. Microclimate Cooling Systems (MCS) are effective in removing excess stored body heat, resulting in reduced body core temperature rise and reduced skin temperature. Operationally, MCS can significantly increase users' mission duration, improve mental acuity, reduce hydration needs and enhance thermal comfort. However, the size, weight, and power consumption of these systems have precluded their use for many users. Thus, there is a need to minimize these parameters to improve the acceptance of MCS for the military and First Responder communities.

Scientific and Technical Areas of Interest:

A comparison of current capabilities versus future battlefield requirements dictates interest in the following major areas of scientific knowledge and technological capabilities:

a. Novel materials and concepts that could provide protection against highly toxic compounds, including toxic industrial chemicals (TIC) and military offensive chemical agents (blister, nerve, etc.) in gross contamination amounts for extended periods (greater than four hours), and biological agents. We are also interested in related exploratory development proposals such that feasibility can be established for the development of improved CB agent/TIC protective and biological agent protective suits, garments, gloves and socks. Proposals which emphasize lighter weight, improved protection, improved decontamination (through the use of self-decontaminating or biocidal materials or materials that can be regenerated in the field), improved durability and launderability, reduced heat stress, and other human factor concerns are of particular interest. For gloves, novel technologies that improve tactility, durability and moisture vapor transport are desired.

b. Proposals for a low cost service life indicator that can be worn or stored inside a chemical protective garment package to visibly display or provide some reading as to the degree of protection remaining in the garment are of interest as are applications of novel polymers and smart materials.

c. Research proposals to reduce/minimize the need for live agent testing to verify the chemical protection of current carbon based sorptive systems.

d. A research proposal on advanced semipermeable or selectively permeable membrane technology that allows selective permeation of moisture while preventing penetration of chemical and biological warfare agents in the forms of liquid, vapor, and aerosol.

e. Garment design and novel closure systems for CB protective clothing system. We are interested in elastic/stretchable polymeric materials such as thermoplastic elastomers for development of closure systems that provide and maintain chemical/biological agent protection in normal and in stretched states.

f. Proposals to investigate mechanisms and garment treatments that capture and possibly react with aerosolized (<5micron) threat particles. Key to this work would be to demonstrate that such treatments could remain effective during the normal use and service life of the protective garment.

g. A research proposal for improved outer shell materials for CB protective garments. We are interested in materials with novel surface modification to either its fibers or the fabric, resulting in an air permeable water repellent material for the life of the garment.

h. Proposal for improved protection against radiation threats. An example would be concern for the potential risk of collateral "E" bomb exposure. The high frequency pulse emitted by these devices might overwhelm traditional shielding methods, thus we have an interest for unique nanotechnologies, or other approaches, that offer some protection against X-ray and low-energy Gamma emissions that could be modified to offer supplemental lightweight shielding for high value electronic equipment worn or carried by the warfighter.

i. A research proposal for waterproof and solvent resistant slide fasteners as well as slide fastener test apparatus for CB agent resistance.

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4. Flame and Thermal Protection for the Individual Soldier.

Flame and thermal protection for the individual Soldier involves protection of the body against a variety of fire hazards that occur in combat (rural and urban warfare), operations other than war, and standard operational duty. New, low cost materials are required to protect against these hazards and reduce burn injuries.

Science and Technology Areas of Interest:

A comparison of current capabilities versus battlefield requirements dictates interest in the following major areas of scientific knowledge and technological capabilities.

Technology is needed for:

a. New, low cost fibers for clothing applications (woven, nonwoven, knit, and batting fabric structures) which provide flame resistance without melt drip characteristics.

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b. Improvements to existing fibers (e.g. incorporate novel flame-retardant chemicals, flame suppressors or char formers into conventional low cost fibers). Novel flame-retardant topical treatments and processes for cotton and other fibers.

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c. Novel concepts and approaches to integrate multiple protection capabilities into materials and clothing systems. Such concepts should integrate flame and thermal protection with other

protective capabilities such as environmental, signature management and electrostatic dissipation.

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5. Countersurveillance.

Survivability is fundamental to the conduct of warfare. The countersurveillance mission is to enhance the survivability of the warfighter on the battlefield by providing textiles for uniforms, individual equipment and paints and textiles for exposed skin that reduce detectability by various sensors. These sensor threats include the eye, near-infrared image intensifiers, short-wave infrared devices, thermal imagers, radar and multi-spectral sensors. Signature suppression with textile and skin camouflage materials usually take the form of dyes/pigments, additives and coatings, although novel and innovative solutions are encouraged. Thermal countermeasures must not degrade existing countermeasures for visual and near-infrared protection. They should be passive, hypo-allergenic and not increase the bulk or heat stress over levels currently imposed by existing clothing systems.

Scientific and Technical Areas of Interest:

Analysis of user requirements and current capabilities indicate the need for:

a. Near and far term research proposals related to novel concepts and materials that:

(1) Defeat the threat of short-wave infrared devices.
(2) Defeat the threat of thermal sensor detection.
(3) Defeat the threat of radar detection.
(4) Defeat multispectral threat sensors.
(5) Provide novel camouflage solutions to current and future sensor threats by exploring the applicability of a wide variety of technical approaches.
(6) Provide protection to exposed hands and facial areas to defeat multispectral sensor detection.

b. Exploratory development proposals related to the above areas under which the feasibility of such proposals may be demonstrated.

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6. Body Worn Interactive Materials.

Electronic subsystems, devices, and sensors are being miniaturized for personal use. Novel materials, technologies, and manufacturing methods are needed to integrate these electronics into textiles, protective clothing, or combat field equipment. There is an interest in the development of textile-based conductive materials and integration of these materials and electronics into textile clothing and individual equipment to provide multiple performance enhancements. Desired materials and products shall be safe to wear, lightweight, flexible, launderable, resistant to corrosion and water contamination, and durable to wear and tear. In addition, novel materials providing sense and respond, or actuation capabilities, power generation, or radio frequency tagging are of interest.

Scientific and Technological Areas of Interest:

A comparison of current capabilities versus future battlefield requirements dictates interest in the following major areas of scientific knowledge and technological capabilities.

Technology is needed for:

a. New fiber forming polymers that provide conductive, radiative or optical performance. Conductivities of conductive fibers should approach that of metals for power/data transmission applications.

b. Responsive fibers and fabrics that can sense and respond to a particular stimulus.

c. Novel manufacturing processes to integrate electro-optic fibers, yarns, films, and materials into fabrics. These processes should be capable of large-scale production of the materials.

d. Techniques to integrate or mount battery powered wireless or wired sensors or other miniature electronic devices into or onto fabrics or other individual equipment.

e. Development of ergonomic connector technologies to attach/detach electronics, sensors to/from network.

f. Methods to translate standard cabling such as USB 2.0, Firewire (IEEE 1394), and Coaxial cables into flat, lightweight, flexible, wearable textile-based conductors.

g. Integration methods of textile based body worn antennas into protective clothing and equipment.

h. Novel wearable power generation technologies to provide minute battery charging capabilities or to provide for direct power of low consumption miniature electronic devices.

i. Lightweight Electromagnetic Interference/Radio Frequency (EMI/RF) shielding capabilities for wearable electronic components and conductive networks.

j. Radio Frequency tagging for technical applications such as local positioning within a building and for inconspicuous data storage and collection.

k. Development of ergonomic computer input devices for handware of other clothing items.

Communication with the technical POC prior to submission of a formal proposal is essential.

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7. Hand Held, Body-Worn Systems and Smart-Lightweight Electronic Components/Modules for Information Management and Cognitive Improvement.

The advanced tactical helmet and body worn electronic systems, components and smart sensors for future individual soldier systems will integrate communications, NBC protection, tactile information displays, including Flexible displays; micro display integration for HMDs weapon sighting/fire control functions, and directed energy weapons (DEW) protection on the warfighter. These will maximize the individual soldier's survivability and situational

understanding on the battlefield. Advanced technology is needed for the miniaturization of lightweight, durable, reliable, low-power requirement displays, sensors, optics, displays, remote threat detectors, and wearable smart electronic components/modules/materials that might be integrated into textiles for disseminating information in a manner in which the human can process it.

Scientific and Technical Areas of Interest:
A comparison of current technology and research activity, and the future needs of the user, has revealed the following areas of interest:

a. Research proposals related to advancing the current technology for lightweight integrated wearable systems, head and body mounted displays, large area displays and body-worn systems that may lead to enhancing the individual soldier's survivability and situational awareness on the battlefield; special interest areas include human systems integration, miniaturization, increased durability and reliability, and components having low power as well as new power solutions that meet manportable system requirements for soldier's survivability and situational understanding. Specific examples of body worn system capabilities include: computers, integrated electronic modules, inter- connections in fabrics, wearable battery technologies, combat identification, tactical engagement simulation capability, system voice control, haptics, neuro- physiological and physiological/medical sensors and data management, integration of individual/team weapon system sensors and controls.

b. Research proposals for various lightweight low power, high resolution helmet and body mounted displays, large area displays and indirect weapon sighting systems, communication and information management capabilities and devices to enhance performance and protect individual soldier's sight and hearing as well as to protect against the varied threats expected in the intense battlefield environment of the future, such as, threat detecting sensors (e.g., chemical/biological toxins, motion, unexploded ordnance, RF, seismic, acoustic and others) and smart electronic modules that think, sense and communicate to the warfighter, such as miniature robotics and robotically controlled sensors, to enhance visualization and situational and cognitive awareness.

c. Research proposals for low weight, low power, high efficiency man portable/wearable systems and components (e.g., antennae, power and/or data bus, sensors, displays) that can be integrated into textiles and other protective structures.

d. Research proposals that integrate with Tech Base areas such as manportable IR and daylight readable display technologies using minimal energy output levels as well as a potential for deicing and defogging capable of meeting performance requirements across all environments.

e. Research proposals for displays and body-worn components, sensors and systems and system components using innovative display and sensor technologies capable of innovative human mounted integration. Critical areas of interest include some or all of the following display attributes:

- active matrix displays and backplanes

- flexible displays
- reduce bulk and weight
- increase field of view
- multifunctional displays, modules and sensors
- reduced power requirements
- bistability and increased bandwidth displays and sensors
- increase pixel resolution/monochrome/color
- incorporate see-through/ reflective/diffractive/scanning/moems/nanotechnology
- technology/occluded/see around/handheld/body-worn
- electronic components that may be integrated into textiles
- components that think, sense and communicate to the warfighter
- Cognition enhancement capabilities

Communication with the Technical POC prior to submission of a formal proposal is essential.

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8. Biomechanics.

Biomechanical tools and data are currently being developed to inform the design of boots, individual body armor, and load carriage gear that reduce injuries, delay fatigue and enhance dismounted Soldier mobility. There is a need for detailed information on the forces acting on the Soldier's musculoskeletal system as well as how their gait, range of motion, rates of movement, energy expenditure, and stamina are affected by their load, its distribution on the body, the terrain and grade of the environment, and obstacles presented by the environment, such as in urban terrain.

Scientific and Technical Areas of Interest:

A review of the existing data and models has revealed the following areas of continuing scientific and technical interest:

a. Information on the manner in which factors such as total weight and centers of mass of jumpers and their equipment, parachute design, landing velocity, body position, and environmental variables, including terrain and lighting levels, affect paratroopers' performance and the risk of injuries in a jump.

b. Development of a suite of biomechanical tools that may be used to assess the physical performance characteristics of Soldier systems of dismounted Soldiers in a broad range of environments.

c. Determine to what degree the biomechanical measures of fatigue may be used to predict performance failure of critical Soldier tasks.

d. Develop predictive fatigue algorithms and integrate them with physiological monitoring systems to provide commanders with real time information on the performance capabilities of their Soldiers.

e. Investigate the effects of acute and chronic head borne weight on Soldier performance, fatigue and the incidence of injuries.

f. Develop physics based data and analytic models/virtual prototyping tools of human locomotion and combat environment individual movement techniques (IMTs) to provide design guidance for individual Soldier equipment.

g. Determine the biomechanical effects of placing loads of varying mass, volume and location on the extremities during typical soldier tasks.

Communication with the Technical POC prior to submission of a formal proposal is essential.

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9. Materials Nanotechnology.

Nanotechnology, the understanding and manipulation of matter at the nanometer scale, offers opportunities to create materials with new or significantly improved properties, relative to known materials. Examples include the numerous reports of small amounts (5-10%) of nanoparticle reinforcement (such as montmorillonite clays or carbon nanotubes) giving rise to mechanical properties in polymers that typically require 30-50% loadings of larger reinforcing fillers to achieve. In some cases, properties are observed in materials with controlled nanometer-scale structures that have not been realized in more conventional material structures. One example is the extraordinary diffusion barrier properties of some nanoclay-filled polymers. Periodic structures with nanoscale features are known to interact strongly with electromagnetic radiation having wavelengths on the order of the feature size. These effects can be used to create new types of resonant structures for enhanced optical performance, for instance the photonic crystal behavior exhibited by materials with controlled structural features on the nanometer scale. Nanoscale periodic structures are also used to create non-conventional optical components such as filters, polarizers and waveplates that can be tuned to operate in specific wavelength regions.

Scientific and Technological Areas of Interest:

There is a need for research and development of materials incorporating nanometer-size architectures, and demonstrating enhanced or novel properties relative to existing materials in the area of physical properties, including mechanical properties, thermal properties, diffusion barrier properties, electromagnetic properties and unanticipated combinations of properties. Composites of polymers with nanometer-scale reinforcements of various forms may offer enhanced mechanical properties allowing equipment to be fabricated with less weight and bulk than current designs and possibly at lower cost. The creation of interpenetrating networks of various compositions, with domain sizes on the nanometer scale, may offer unprecedented properties. Fiber materials with controlled nanometer-scale architectures may have application to the development of high strength or multifunctional textiles. Particular areas of application for the materials of interest include personnel armor, airdrop systems, shelters and load carriage systems, packaging materials, textile-integrated electronic systems and tactical optics. The unique combination of properties observed in carbon nanotubes offers great potential for the development of advanced materials, and research on nanotubes and materials based on them is of interest. In addition to the fabrication of new materials, research efforts are needed to understand the nanoscale origins of bulk properties observed in nanocomposite or nanostructured materials that could aid in the design optimization of material structures for particular applications.

Specific materials of interest include new nanostructured, nanophase materials or nanocomposite materials of polymer/polymer, polymer/ceramic, polymer/metal or other compositions that have the potential to provide large specific performance gains over existing engineering materials, which have unique or unanticipated properties with potential military applications or have the ability to incorporate multiple material functionalities into a single material.

A major barrier to the fabrication of nano-structured materials is the efficient dispersion of nanometer particles in a host matrix. Research dealing with processing techniques, such as self-assembly phenomena or other means of economically creating nanoscale architecture in materials is of interest. New techniques that will enable the creation of periodic structures with decreased feature size are of interest and the ability to control the geometry of nanosized elements and their periodic configuration is also of interest. Economically feasible scale-up of processes to create nanostructured materials is of interest.

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10. Lightweight Conformal Solar Cells.

The power incident from the sun, at the earth's surface, is on the order of $1kW/m^2$. Conversion of this power, even at moderate efficiencies could be a major renewable, clean and inexpensive energy source, there for the taking. The operation of solar cells is based on the photovoltaic effect, which is the generation of a voltage and/or current by absorption of light in certain materials or combinations of materials. To date, the primary materials that have found commercial application are a variety of inorganic materials including silicon (crystalline, multicrystalline and amorphous), copper indium diselenide, indium phosphide and gallium arsenide, with cell efficiencies averaging around 18-20%. These materials however remain limited because of high cost and inability to process them into lightweight, conformal devices. Therefore, much research has been devoted to the development of new materials that can address these limitations and further improve device efficiencies. It is well known that organic materials can offer lower cost, lower weight, facile processability and tailorability of the photoelectric response. However, the efficiencies of organic based devices are currently too low for practical use. Recently, it has been demonstrated that cells composed of both organic "light-harvesting" materials and inorganic "nanocrystalline" (high surface area) materials can provide sufficient conversion efficiencies and current densities to make practical applications feasible (Gr≅tzel). This is a relatively new realization in photovoltaic research and it is anticipated that improvements in these unique "hybrid" (organic/inorganic) materials, along with ongoing

developments in nanostructured materials, will provide exciting advances for wearable solar cell devices.

Scientific and Technological Areas of Interest:

There is a need for research to develop new materials and new methodologies to effectively integrate promising organic and inorganic materials into hybrid devices for wearable solar cells with maximum energy conversion efficiencies. Towards this, new light-absorbing materials that are more stable and more efficient light absorbers are needed. Also, new processing approaches are needed that can increase the surface roughness to improve energy collection and maximize interfacial interactions such that charge separation occurs before recombination. Devices that are portable, rugged, lightweight, flexible and conformal to a variety of materials, in particular fabrics, are desired. Organic light-harvesting dyes or polymers coupled with inorganic semiconductor materials into interpenetrating nanofibrous or nanocomposite structured networks may offer a low cost, viable approach to meet these needs. Particular areas of application include wearable solar batteries for the soldier (garments, helmets, backpacks and removable patches) to provide modular energy units and tentage materials for shelters. In addition to the development of these photovoltaic devices, coupling with appropriate capacitors for energy storage as well should also be considered.

Materials of interest include new nanofibrous or nanocomposite structured organic/inorganic hybrid systems. Specific materials may include light harvesting and charge-transfer dyes or polymers, conducting polymers, inorganic semiconductor materials and nanoparticles, flexible and transparent electrodes, and conducting fabrics.

A major barrier to the fabrication of wearable solar cells will be effective integration of the components in the device such that energy collection is maximized and charge recombination is minimized. This will be necessary to reach conversion efficiencies high enough for practical application.

Communication with the Technical POC prior to submission of a formal proposal is essential.

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11. Anthropometry

The NSC has traditionally maintained an extensive anthropometric database on U.S. Army and other military personnel. Anthropometric data are needed on Active Duty, National Guard, and Army Reserve personnel in order to facilitate the design and sizing of personal protective clothing and equipment systems. These data are also required for the design and layout of general-purpose workstations and combat vehicle crewstations. Virtually all military system development requires access to accurate body size data at some point in the design process. U.S. Army anthropometric data are also used by military contractors, other government agencies, and industry. The most recent anthropometric survey of U.S. Army personnel was conducted in 1988, and a need currently exists to update this information.

Scientific and Technical Areas of Interest

Obtain traditional anthropometric measurement information on Active Duty, National Guard, and Army Reserve personnel in accordance with data collection standards established during the 1988 survey of U.S. Army Personnel.

Develop and implement quality control measures to include data editing and other means that serve to ensure the accuracy of anthropometric data collected during the course of the survey.

Develop data collection methods and procedures as required to support the acquisition of a well-defined set of body measurements that permit the assessment of anthropometric changes over time and also permit the comparison of U.S. Army personnel data with other U.S. and foreign military populations.

Traditional anthropometric data collection as well as three-dimensional whole body and body segment scanning of survey participants will be performed by the offeror. Close coordination between the government and offeror on such matters as the final dimension list, body landmarking requirements, quality control implementation, and data cleaning shall be required throughout the duration of this large scale data collection effort. It is anticipated that a cost sharing contract will be used to execute this anthropometric data collection effort.

Communication with the Technical POC prior to submission of a formal proposal is essential.

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12. Advanced Protection and Integration Technologies and Systems.

As protective and structural technologies get more advanced, opportunities emerge to integrate multiple functions into fewer layers and components. As the Army transforms over the next decade to a lighter, more agile and lethal force, the individual warrior's set of protective clothing and individual equipment must also transform. The Army is seeking a revolutionary approach to system design and integration using emerging technologies and technology trends. New and emerging technologies and design concepts must be explored to provide the warrior with combat overmatch through significant advances in survivability, mobility, and cognitive/physical warrior performance. An advanced integrated combat uniform system will emerge as the foundational centerpiece for the human interface, load bearing, protection, and electronics hardware linkages for the future warrior systems. System weight and bulk reduction are key goals of this effort. Significant mission benefits to the soldier include: longer mission time (endurance) in hot/cold, and/or chemical/biological environments; improved warrior performance, both physical and cognitive in all mission environments; reduced heat stress casualties; reduced water intake requirements; enhanced cold weather protection; and enhanced mobility due to reduced bulk and protrusion of electronic devices and interfaces.

Scientific and Technical Areas of Interest:

Research proposals to develop combat uniform and integration system design concepts and breadboard prototypes, to include integration of multiple technologies into fewer textile-based structures and/or system components. Examples include, but are not limited to, integration of ballistic protection and load bearing functions, integration of chemical/biological agent protection with environmental protection and signature management, integration of novel closure and interfaces for advanced protection and electronic networking capabilities, integration of power/data bus, sensors and connectors into textiles and other protective structures.

Research proposals for novel design approaches and technologies to provide enhanced passive physiological management, active ventilation, and/or heating and cooling concepts suited for dismounted soldier applications.

Research proposals to develop and implement measures, assessment tools, and analysis of cognitive and physical warrior performance, especially as it relates to the soldier's body worn system.

Communication with the Technical POC prior to submission of a formal proposal is essential.

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U.S. Army Soldier Systems Center
Natick Soldier Center
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13. Warrior Performance

Warrior Performance is the degree to which a warfighter's skills and abilities are implemented for a particular task or set of tasks. It is specific to the military operational environment. There are on-going efforts to generate data in the area of human factors as it relates to Warrior Performance, however, most of these efforts relate to the physical aspects of performance. Though significant work is being done through these efforts more work remains in order to gain a complete picture of the relationship of the warrior to his/her environment. Concentration on the cognitive aspects of individual warrior performance is lagging. Significant work still remains to be done in this area as well. The objective of this area of study is to generate methodologies as well as relevant data that can be applied directly to the development of emerging warrior systems with equal emphasis on physical and cognitive performance and can be utilized by emerging behavioral models for the same purpose. The warrior performance target audience includes male and female: Dismounted Infantry, Mounted Infantry, Engineers, SOF, Medics, Army Aircrew and Military Police.

<u>Scientific and Technical Areas of Interest:</u>

Development and validation of quantitative measures and criteria as well as methodologies for evaluating these areas is a key element of any proposed effort.

a. Research to determine the performance of individuals and small units with respect to their Situation Awareness. Influencing factors for investigation should include, but not be limited to, maturity, skill, experience, motivation, risk acceptance, training and learned versus inherent propensity for situation awareness. Studies may also include the impact of mission (e.g., complexity, type, intensity), mission environment (e.g., MOUT,

Jungle) training proficiency and unit dispersion on the SA of individuals and small units. Studies on the impact of different technology types on situation awareness, and situation awareness and the 'small unit dynamic' are also of interest.

b. Studies on the effect of fatigue on warriors to include, but not be limited to, the influence of mission on physical and cognitive fatigue, quantification of the physical/cognitive relationship of fatigue, quantification of different types of fatigue (e.g., muscle, cognitive, systemic) and their impact on warrior performance, determining mitigating factors of fatigue related to training and determining whether levels/degrees of fatigue be can predicted based on personal characteristics.

c. Research to determine differences in warrior performance due to varying missions (e.g., attack, raid, SASO) and mission environments (e.g., Desert, Artic). This research should highlight the impact on physical and cognitive warrior performance.

d. Taxonomy – Develop taxonomy of measures and associated criteria of physical and cognitive warrior performance.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC:
Ms. Cynthia L. Blackwell, TEL: 508-233-5210, cynthia.blackwell@natick.army.mil

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D. TENTAGE, FABRIC STRUCTURES AND RIGID WALL SHELTERS.

The objective is to enhance the protection and capability provided to warfighters and warfighter systems that use soft, rigid wall, and hybrid shelters. Threats include combat and the

environment, and capabilities include mobility, transportability, durability and producibility. Research and development enhancements are grouped into seven primary thrusts areas. These are: 1) Ballistic Protection; 2) Chemical/Biological Protection; 3) Electromagnetic Interference/Electromagnetic Pulse Protection; 4) Environmental Protection; 5) Detection Avoidance; 6) Deployment/Durability; and 7) Functional Integration of Multiple Technologies.

Scientific and Technical Areas of Interest:

The following examples (though not inclusive) represent areas of science and technology that are relevant to the objectives of the Tentage and Rigid Wall Shelters area and may be of interest to the Army.

a. Lightweight rigid shelter panels and/or structures effective against ballistic threats including ceramic/epoxy/fiberglass composite panels with capability of localized/variable protection; applying protection only where critically needed and to the level needed.

b. High strength, lightweight, flexible, and affordable ballistic resistant fibers, fabrics, or fabric composites for tentage (flexible, thin, abrasion resistant).

c. Flame retardant fibers and fabrics that maintain mechanical strength, wear, and weather resistance for materials used for tentage applications.

d. High permeability and high conductivity structural composites that provide EMI/EMP shielding.

e. Bonding techniques that guarantee long-lasting shielding continuity and integrity at seams and cutouts of rigid wall shelters.

f. Technologies related to collective protection shelters including barrier and reactive materials, hermetic structural closures and entry/exit systems.

g. Lightweight, low-cost, shelter treatments that reduce visual, IR and radar signatures.

h. Insulative shelter panel shielding technologies that minimize the acoustic and thermal signatures associated with on-board power generators.

i. Low bulk and low cube insulative liners for tentage that may utilize active methods of membrane dispersion to produce dead air space and high insulation.

j. Superinsulative panels for rigid wall shelters using technologies such as high vacuum sandwich panels.

k. Novel stitching and joining techniques for leak-free seams in tents through the possible use of durable, composite threads that permanently expand with application of a stimulus (e.g. heat) to eliminate the possibility of tent seam leakage due to needle holes, as well as increase seam strength.

l. Net-shape manufacturing processes for fabric structures utilizing tubular materials with integral end close-outs that form the final shape of a fabric structure without seams except for doors and windows.

m. Technologies related to the maturation of inflatable structures that carry high loads, are reliable and affordable. Related topics include the development of rapid airbeam inflation systems; and technologies for long term deployment of airbeam structures, such as alternative inflation substances, and rigidifying.

n. The development of alternative applications for new inflatable pressurized composite structures technology such as breakwaters, fendering systems, rapid port enhancement, water/fuel containers, munitions barricades and high pressure hoses.

o. Pultruded lightweight, low-cost, thin, width up to 8 feet, composite panels for expandable rigid wall shelters. Highly expandable rigid wall structures that use pultruded panels, with expansion ratio of 12 or higher.

p. Self-erecting tents and shelters utilizing novel technologies such as shape memory materials and phase change materials.

q. Integration of multiple shelter technologies (ballistic/detection avoidance/EMI/EMP/CB) to demonstrate a highly-protected "operate-on-the-move" command post.

r. Integration of multiple shelter technologies to demonstrate a shelter complex that provides multiple survivability capability integral with the system's components, along with rapid deployment through low weight, high expansion, and airbeam support.

s. Modeling of nonlinear fabric structures, fabric/yarn mechanics, constitutive relation, wind structure interactive modeling, and failure criteria.

t. Functional treatments of tentage fabrics that produce reduced effects from solar loading, the capability to accept camouflage printing, and the capability to accept insecticides, etc.

u. Technologies that improve shelter soil/structural interfaces in world-wide environments to include soil stabilization and improved anchoring techniques.

v. Soft wall shelters that become rigid with application of external stimulus, using reversible rigidizing polymers.

w. Applications of electrotextiles to rigid and soft-walled shelters.

x. New technologies that will benefit shelter electrical systems such as high efficiency lighting and field photovoltaic systems.

Some of the technical approaches for topics within this solicitation may be subject to export control restrictions under existing export control laws, and/or required to be conducted as classified projects as outlined in the National Industrial Security Program Operating Manual (NISPOM) and its supplements. Contractors who would like to submit proposals pertaining to such technologies are encouraged to contact their local Defense Investigative Service (DIS) Industrial Security representative or have the Technical POC listed in the solicitation for guidance.

Communication with a Technical POC's prior to submission of a formal proposal is essential.

Technical POC's:

Ms. Jean Hampel, TEL: 508-233-4692, jean.hampel@natick.army.mil

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Contract Data Rqmts POC:
Ms. Arlene Garwood, TEL: 508-233-5338, arlene.garwood@natick.army.mil

All concept papers, proposals and administrative inquiries should be submitted to:

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Natick Soldier Center
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Kansas Street
Natick, MA 01760-5018

E. AIRDROP - ADVANCED PERSONNEL AND CARGO AIRDROP SYSTEMS.

Airborne force projection and aerial delivery methods are critical operational capabilities of the military's strategic shift toward a CONUS-based force. Increasing mission responsibilities now include humanitarian missions. Airdrop science and technology is focused on: 1) increasing aircraft/airborne force survivability in a threat environment by expanding the airdrop operational envelope; 2) improving airdrop accuracy through the introduction of standoff (of various levels) precision guided aerial delivery platforms and low level airdrop systems; 3) reducing personnel injuries/casualties by improving system functional reliability while reducing ground impact velocity, oscillation, and exposure time to threats; and 4) reducing the cost and time required for parachute development and production by new manufacturing techniques and using novel new parachute designs developed by computational analytical methods to reduce manufacturing and testing requirements.

Scientific and Technical Areas of Interest:

An assessment of current personnel and cargo airdrop capabilities and ongoing research and development efforts versus future requirements has led to the following areas of interest:

a. Cargo airdrop technologies should focus on precision aerial delivery for heavy cargos and varying ranges off-set distances, including highglide and extended off-set powered systems. Affordable high altitude precision delivery systems and low cost guidance, navigation and control (GN&C) systems are also desired with compatible mission planning systems at various levels of integration with delivery platforms.

b. New personnel parachute systems are needed to provide accurate delivery as well as low velocity landings coupled with ground wind attenuation to minimize body injuries. High glide and high off-set distance canopy designs, along with high tech communication, video, and global positioning systems are needed for steerable personnel parachute systems. In-flight communication systems for high altitude deployed paratroopers and HALO/HAHO navigation aid systems for SOF units. In addition, lightweight oxygen systems for high altitude deployed paratroopers.

c. Advanced construction methods for low cost manufacture of ram-air gliding wings, round, cross and other parachute systems.

d. Development of interactive parachute textiles to monitor and improve parachute and airdrop system performance, such as canopy fabric structural behavior during inflation, variable porosity canopy fabric and glide ratio, fabric structural integrity indicator, and environmental-adjustable fabric.

e. Modeling and experimental investigation of the inflation and steady descent of parachutes, including modified round canopies, single-skin and ram-air parafoils, and new parachute design for high altitude and off-set precision aerial delivery of military payloads.

f. Modeling and experimental research on the biomechanics of paratroopers during parachute deployment and landings, body protective devices to minimize body injuries, and avoidance measures for towed jumpers.

Communication with a Technical POC prior to submission of a formal proposal is essential.

Technical POC:
Mr. Richard Benney, TEL: 508-233-5835, richard.benney@natick.army.mil
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All concept papers, proposals and administrative inquiries should be submitted to:

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Request all concept papers and proposals submitted be copy furnished to:

U.S. Army Soldier Systems Center
Natick Soldier Center
ATTN: AMSRD-NSC-AD-J /Mr. Richard Benney
Kansas Street
Natick, MA 01760-5017

F. TEXTILE TECHNOLOGIES.

Textile technology programs relate to protection of the individual Soldier against battlefield threats such as ballistic, Soldier detection, chemical, biological, fire, thermal and directed energy, while ensuring survival under extremes of environmental (temperature and humidity) conditions by involving comprehensive research and engineering. In addition to threat survivability, there is a strong interest in the new and growing field of "wearables." The wearables field is of interest insofar as it relates to the integration of electronic capabilities in to textile materials, combat clothing and combat field equipment worn by Warfighters. The following is a summary list of textile technologies of interest to the Natick Soldier Center:

a. Polymer synthesis and characterization
b. Fiber morphology and mechanical property characterization
c. High-strength fibers, i.e., fibers from liquid crystal polymers
d. Yarn and fabric manufacturing and fabric preparation and finishing processes
e. Photochemistry and photophysics of dyes and dyed textiles
f. Methods for sorbing/reacting chemical warfare agents in lightweight, low-heat stress textile systems.
g. Producibility of unique fibers and fabrics
h. Thermally resistant insulating textile systems
i. New technologies for the characterization of textile systems properties (e.g. electrostatic, electromagnetic, durability; and flame, thermal and ballistic resistance).
j. Consideration of comfort and physiological implications of protective clothing.
k. Polymer batteries and lightweight sources of power.
l. Power junctures and connections integrated in to textiles for access and supply of power to electronic components.
m. Connections for power and data wires to electronic components and sensors.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC:
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G. MODELING AND SIMULATION.

1. Individual and Small Unit Performance and Survivability. Ballistic, chemical, and environmental casualty assessment models plus unit performance models have been used to show the relative benefit of one proposed protective clothing ensemble design versus another. Initial work has been accomplished to support the integrated analytic simulation of individuals and small units to assess their potential survival and performance when equipped with current or proposed individual combatant clothing and equipment ensembles. Work has been accomplished to link this integrated analytic environment to other analytic and training simulations using both Distributed Interactive Simulation (DIS) protocols (IEEE Standard 1278.1) and DoD High Level Architecture (HLA) approaches. The resulting integrated analytic simulation environment is the Infantry Warrior Simulation (IWARS). The IWARS currently provides simulation of various casualty mechanisms from ballistic, chemical, and environmental hazards as well as providing simulation of individual and small unit movement and combat.

Scientific and Technical Areas of Interest:

A review of the existing models and simulations has revealed the following areas of continuing scientific and technical interest:

a. Development of a methodology and model to simulate the effects of battlefield stresses, such as physical exertion, sleep deprivation and heat stress on the various types of fatigue and ultimately on infantry task performance.

b. Development of a methodology and model to simulate the target detection, recognition, identification and acquisition process under various lighting and operational conditions.

c. Development of a real time, 3 dimensional, DIS/Higher Level Architecture (HLA) compatible Windows based synthetic visual and audio environment.

d. Development of a methodology and model to simulate inter-human communication to include voice, radio, visual, and written display.

e. Enhance the IWARS and associated supporting models to support automated communications with other standard U. S. Army and NATO analytic simulations and war games such as JCATS, COMBAT XXI, OneSAF, and CAEN.

f. Enhancement of the IWARS and associated supporting models to allow user to parametrically analyze capability requirements and accomplish the full range of virtual prototyping and testing of individual clothing, equipment, and weapons.

g. Technological assets which would result in a full Soldier Systems Integration Laboratory capability, that would allow full assessment of fightability under controlled laboratory situations.

h. Tools and capabilities, especially in the studies and analysis area, that allow us to assess contingencies in missions ranging from peacekeeping to peacemaking to combat.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC:
Mr. Roger A. Schleper, TEL: 508-233-4881 roger.schleper@natick.army.mil

All concept papers, proposals and administrative inquiries should be submitted to:

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2. Wargaming Concept and Tool Development. The execution of wargames through the use of models and simulations enables the validation and assessment of the combat worth of warfighter systems and subsystems. These exercises permit the conduct of integrated, multi-domain analyses that allow the complex relationships between warfighters, their equipment, and the battlefield environment to be explored. The implementation of network-centric warfare can provide a distinct warfighting advantage through the development of a common operating picture and an increased level of situational awareness and cognitive understanding of tactical and operational situations. The combination of emerging tactics, techniques, and procedures that a networked joint force can employ allow the full exploitation of the highly path-dependent nature of information warfare from the battalion to small unit level. The cooperative use of models in wargaming such as the Simulation Training and Analysis for Fixed Facilities/Sites (STAFFS) model and the Infantry Warrior Simulation (IWARS) allows for the assessment of survival and performance as they apply to fixed-sites and maneuver units within a simulated environment.

<u>Scientific and Technical Areas of Interest</u>:

A review of the existing models and simulations related to wargaming has revealed the following areas of continuing scientific and technical interest:

a. Analyses of operational concepts, military strategy and doctrine as they pertain to wargaming and wargaming objectives.

b. Integration of simulation models for use in wargaming exercises.

c. Development of wargame scenarios for the assessment of battlefield operations and equipment.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC:
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All concept papers, proposals and administrative inquiries should be submitted to:

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H. NEUROEPIDEMIOLOGY.

Epidemiological field research methodology and improvements in the assessment and early detection of adverse neurological health and performance risks are critical for protection of Soldiers' health. The primary goal of the research program is to apply epidemiological field study methodologies to identify and better understand the adverse neurological health and performance risks associated with deployment operations and military service in general. Areas of study to be addressed include: feasible biomarker(s) of acute, chronic, and cumulative exposures to neurotoxicants present in the military occupational environment, field-tested techniques for the assessment of exposure to neurotoxicants (particularly chronic exposures), neurocognitive outcomes assessment, neurophysiological markers of early effect, and long-term neurological health consequences of deployment and military service.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC:
Dr. Susan Proctor, TEL: 508-233-4465, susan.proctor@us.army.mil

All concept papers, proposals, and administrative inquiries should be submitted to:

U.S. Army Research Institute of Environmental Medicine
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I. NATIONAL PROTECTION CENTER

Homeland Defense and Security professionals share a surprising number of research and development interests and needs, related to the protection of the human body against conventional and new threats. The establishment of the Department of Homeland Security and transformation of military doctrine and tactics to support multiple theater operations and environments (disaster relief, homeland focused national security, international conflict in urban environments, peace keeping operations), and high public awareness of these activities, further increases the interest on dual-use applications of concepts, doctrine and technology. Since its inception, the Natick Soldier Center's alliance with the National Institute of Justice, Office of Science and Technology, National Aeronautics and Space Agency (NASA) and with the addition of the Department of Homeland Security, has been committed to foster inter –agency concept of use analysis and formulation, technology prioritization and planning, and research, development, test and evaluation projects. The multi-agency alliance is interested in technology vetting processes as well as research, development, test and evaluation (RDT&E) efforts, such that RDT&E efforts maximize benefits to the end users. Activities include: sharing of intellectual and physical resources, evaluation of multi-user requirements and interagency operating procedures, equipment standardization/standards analysis, concepts of operation and doctrine analysis, Commercial and Government Off-the-Shelf (CoT/GoTs) assessment, implementation of best business practices, RDT&E program execution where gaps have been identified.

The Future Force Warrior, and other Natick Soldier Center human protection and integrated system programs attract high interest from users and operators from a wide range of disciplines and agencies nationwide, yet there is a need to further understand how these concepts and technologies apply to a broader range of homeland defense and homeland security operations. NSC's National Protection Center (NPC) is dedicated to the coordination, oversight and implementation of DoD Homeland Defense and Homeland Security (HLD/S) and Technology Transfer directives through inter-agency/alliance driven dual-use and technology transfer focused efforts. The NPC is the NSC's focal point for providing a wide range of HLD/S functions related to assessing business practices, inter-agency policy development, fund and conduct research, development, test and evaluation through NSC's and its allied partners core competencies. Primary objective is to ensure proper vetting practices, serve in a multi-agency Senior Advisor capacity, and accelerate technology transfer of advanced protective technologies and integrated systems for homeland defense/security operations. This will be accomplished by a multitude of activities that include but are not limited to:

a. Technology Transfer. The Center will facilitate the transfer of technology - government to government, government to industry, industry to government, academia to industry, and so forth. This goal will be achieved through multiple vehicles, partnership/leveraging and other mechanisms.

b. Prioritizing, Managing and Funding Research, Development, Test and Evaluation (RDT&E) of individual or integrated personal protective materials or systems. Where funded, the Center will serve as multi-agency/team project manager on behalf of the funding agency or organization. The process will include requirement and gaps analysis

c. Human Systems Integration. The Center will maintain a capability and expertise in systems integration, as it would pertain to treating the warfighter and/or other human operational platforms as a system.

d. Conduct Technology Assessments: The Center will analyze subject areas (e. ballistic protection) from the standpoint of deficiencies in standards, requirements, doctrine and technology and/or equipment both in the military and commercial sector, and make recommendations that will assist in overcoming these deficiencies. These assessments can then be used as the input for R&D of dual-use Homeland Defense/Security personal protective clothing, equipment and integrated system proposals or projects.

e. Market Analysis. Prior to conducting R&D on a technology or product development, the Center will carry out a market analysis to determine the potential for the development to meet the customer's needs and/or to become a commercial success and to identify potential industry and academia participants.

f. Product Test and Evaluation. The Center will participate in standards analysis and development and will maximize inter-agency collaboration. Products may be tested and evaluated at the request of and by its operating members and under specific user operational scenarios, to assure the capabilities are consistent with the needs of the user and provide the requisite levels of protection and operational effectiveness and to evaluate them in non-conventional applications, perhaps revealing new commercial applications/markets.

g. Network Services. Where appropriate, the NPC will act as a network agent to match capabilities and sources from government, industry an academia in support of its members.

h. Customer Support. The Center will maintain a capability to respond to customer's needs in terms of field problems encountered with protective equipment.

i. Conferences. The Center will sponsor and conduct conferences and symposia on subject matters fitting into the scope of the Center as outlined above.

Specific Areas of Interest:

a. Proposals that address the process of gaining advocacy from private industry, academia, and government entities

b. Proposals that address the mechanics of operating the Center or suggest ways of developing effective alliances/strategic partnerships.

c. Proposals that address potential areas of study, technology vetting procedures, interagency business practices, end item analysis and development based on integrated concepts with high dual-use applicability.

(These projects must be unique in nature (not proposed under other project areas), of high dual use value with the ability to span a multi-user base and that encourage/maximize public-private partnerships and academia participation. A path to transition the proposed work to commercialization must be part of the proposal. Affordability of end items or cost effectiveness of basic studies should be inherent in the proposals.)

Communications with the U.S. Army Natick Soldier Center NPC Team prior to submission of formal proposal is essential

TECHNICAL POC:
Ms. Rita Gonzalez, Director, National Protection Center, Tel: (508) 233-5571, rita.gonzales@natick.army.mil

Ms. Andra Kirsteins, Senior Systems Integrator, National Protection Center Program Office/Operations, Tel. (509) 233-5258, andra.kirsteins@natick.army.mil

All concept papers, proposals and administrative inquiries should be submitted to

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J. SUAVs and ADVANCED TECHNOLOGY.

1. Small Unmanned Aerial Vehicle (SUAV) Technology.

Unmanned aerial vehicle (UAV) technology has had a dramatic impact on the battlefield in recent years, permitting commanders and individual warfighters to understand and develop a situation before making contact, maneuver largely out of contact, and only then, initiate decisive action, bringing all inherent capabilities to bear with accuracy and lethality. The ability to collect and disseminate real-time battlespace information is a critical need. Uncertainty about hostile and friendly conditions on the battlefield dictates cautious movement and a requirement for response options to any number of contingencies, with resulting expenditure of time and resources. This is often followed by initiation of action at times and places not of the commander's choosing.

Effort is underway to develop and integrate technologies addressing the following:

- A more efficient and effective use of available bandwidth appropriate to a 2-10 pound SUAV.
- A greatly improved ability to detect and identify potential battlefield threats.
- The ability to engage those threats with organic and precision indirect fires.
- The ability to conduct SUAV missions with higher reliability, minimized size/weight, and/or maximized range/endurance.
- The tools to train effectively, maintain proficiency, and evolve tactics, techniques and procedures.

Scientific and Technical Areas of Interest:

Concept papers and proposals are requested in the following areas and are not necessarily limited to the specific areas of interest indicated:

a. Payloads for integration: imaging, image processing, acoustic, targeting, chemical, etc.

b. Targeting: image processing, differential GPS, etc.

c. Command, control and communications (C3): digital links, communications networks/protocols, relays, encryption, etc.

d. Platform technology: miniaturized avionics, improved propulsion, pocket sized platforms, improved power sources, fuel engines, etc.

e. Simulation and training: battlespace simulation, hardware in-the-loop trainer, etc.

Additionally, technology candidates must exhibit the following characteristics:

a. Technical readiness level of 5-7.

b. Stand-alone system requiring no large residuals such as HMMWVs or other vehicle/infrastructure for support.

c. Minimized weight, volume, manpower requirements, and power consumption for either subcomponents suitable for integration into existing platforms or newly proposed systems/platforms.

The development timeframe for this effort is October 2005 through July 2008.

Communication with the technical POC prior to submission of a formal proposal is essential.

TECHNICAL POC:
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All concept papers, proposals, and administrative inquiries should be submitted to:

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Natick, MA 01760-5000

2. Individual Warrior Technology

Operational capability gap analysis has indicated that the following technical areas warrant research and development efforts.

a. Individual cultural integration/interaction to include:

- language translation,
- Medical Support,
- Interrogation / Information collection/dissemination aids in coalition efforts
- Individual collaborative tools for coalition efforts

b. Internal tactical communications and control for teams, for both close-in and distributed teams to include internal collaborative tools, displays, etc.

c. Maintain situational awareness to both blue force and red force status (location, intent, capabilities, etc.) internal and external to team/squad/platoon.

d. Ability to locate, mark, illuminate and designate targets from extended ranges without detection.

e. Move, dismounted, over open terrain, natural and man-made obstacles, with large loads (100-300 lbs), without leaving a visible signature behind.

f. Inidividual power providing high energy density, and high current density.

g. Navigate to and from objectives in high threat areas without being detected, in all conditions of visibility.

h. Protect against improvised explosive devices, kinetic weapons, and fragmentation devices.

Communication with the technical POC prior to submission of a formal proposal is essential.

TECHNICAL POC:
Andrew J. Mawn III, TEL: 508-233-4262, andrew.mawn@natick.army.mil

All concept papers, proposals, and administrative inquiries should be submitted to:

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K. SOLDIER TECHNOLOGY TRANSITION OFFICE

The Soldier Technology Transition Office has been established within the Natick Soldier Center to identify user requirements and operational deficiencies in a variety of operational areas that are amenable to solution through application and exploitation of the existing technology base. The intent is, to the greatest extent possible, to leverage existing technologies and where possible provide for early application and entry of these technologies in to the field.

Concomitant with this need is the requirement to actually solve identified problems and deficiencies. These solutions will often take the form of complex, multi-disciplinary and multi-agency collaborations, to include government, industry and academia. However, due to the complex nature of these collaborations, it will be necessary to have single, or very limited, spans of control, coordinating these efforts to optimize the resources spent and return to the government on investment, yet still efficiently and effectively meeting the needs of the end user.

To most effectively meet this evolving mission area, it will be necessary to asses, evaluate and exploit existing resources and capabilities, focusing on integrating in innovative and unconventional ways existing and evolving technologies, but also being able to identify and implement research plans to fill gaps in existing tech base capabilities and resources.

However, where it is not practical or desirable to use existing tech base resources, accelerated efforts building on already existing programs will be employed. Particular emphasis will be applied to the various and diverse array of technologies and programs extant within a variety of environments, including but not limited to DOD and other governmental agencies. While the focus is on long range, high risk, high-payoff programs there are nonetheless numerous opportunities for early transition of programs towards focused requirements. Effort will be made to identify both candidate technologies and programs to apply this paradigm to.

Failing this, however, focused research effort to fulfill specific needs and bridge identified gaps in the tech base, will be implemented. Ultimately, final efforts will consist of a combination of acquisition, advanced development and basic research, all focused on achieving an end capability to fulfill a defined deficiency.

Scientific and Technical Areas of Interest:

Assessment of the needs of the various user communities has shown value in providing support for technology identification and program management and integration functions in a variety of areas. These areas include the following:

a. Research proposals for advanced and innovative technology review. This would include maintaining an understanding and innovative utilization capability of advanced technologies. Efforts might consist of supporting and coordinating meetings with other government agencies, contractors, and educational institutions, as well as any other source of information or technology deemed useful. These meetings will provide a primary source of information concerning both technologies and requirements.

b. Research proposals for technology utilization support. This would include the process of identifying and analysis of opportunities for government program managers, as well as evaluating transition potential for existing and new technologies. Efforts would include gathering and correlation of data on a wide array of technologies, as well as assisting in assembly and evaluation of requirements from all users. Other efforts might include obtaining various technologies, through whatever means appear appropriate, and assess and evaluate their utility. This will be done through a variety of means including purchase, custom-design, development, and integration of existing systems. Evaluation will be under a variety of conditions including operational and laboratory.

c. Research proposals for the prototyping, manufacturing, assessment and delivery of systems for use by the government. Efforts would focus on use of various technologies transitioned from other arenas. Efforts may include location and identification, analysis and assessment, assembly of multi-disciplinary teams and management of integrated efforts to achieve an end capability in as optimal manner as possible.

d. Research proposals to evaluate operational environments and requirements. Efforts would focus on supporting the evaluation of operational environments for determination of technology transition and support opportunities. These might include observation, participation, and evaluation and analysis of operational situations, primarily involving training scenarios, but potentially involving actual operational missions. Mission areas may include military, Federal Agency, and civilian missions as appropriate and required.

e. Research proposals to develop and implement processes for rapid response and prototyping needs of critical, high priority missions. Focus would be on developing a capability to meet rapid response to prototyping requirements as well as assist in the methodology implementation of a wide array of users and mission oriented agencies. This will include evaluation of existing capabilities, development of a method of scheduling and coordination of work, support of design conception and implementation, managing of the manufacturing process, evaluation final product and iterative design changes as required to meet user needs.

f. Research proposal focused for the integration and implementation of multi-disciplinary, multi-agency and multi jurisdictional integrated efforts to meet complex programs needs. This would include the analysis and identification of key problems and solution approaches, the creation of integrated program implementation and problem solution plans, and the overall management of resources, assets, and creation of programs to meet these needs. This may include a combination of in-house assets and resources, subcontracting to various industrial and academic centers, and coordination and collaboration (through various vehicles to include CRDAs) of and with various government agencies and organizations. The efforts will consist of overall analysis, management and integration of highly complex and diverse resources to meet the needs of the end user. This process may

culminate in products ranging from prototypes of materiel solutions through complete delivery and IOC to analysis and recommendations of doctrinal or procedural changes.

Specific Areas of Interest:

A. Technology Transfer. The Soldier Technology Transition Office will facilitate the transfer of technology - government to government, government to industry or academia, industry or academia to government, academia to industry, and so forth. This goal will be achieved through multiple vehicles, partnership/leveraging and other mechanisms.

B. Prioritizing, Managing and Funding Research, Development, Test and Evaluation (RDT&E) of defense technologies and basic research, individual or integrated personal protective materials or systems. Where funded, the Soldier Technology Transition Office will serve as multi-agency/team project manager on behalf of the funding agency or organization. The process will include requirement and gaps analysis.

C. Human Systems Integration. The Soldier Technology Transition Office will maintain a capability and expertise in systems integration, as it would pertain to treating the warfighter and/or other human operational platforms as part of a system.

D. Conduct Technology Assessments: The Soldier Technology Transition Office will analyze subject areas (i.e. ballistic protection) from the standpoint of deficiencies in standards, requirements, doctrine and technology and/or equipment both in the military and commercial sector, and make recommendations that will assist in overcoming these deficiencies. These assessments can then be used as the input for R&D of dual-use Homeland Defense/Security technologies, personal protective clothing, equipment and integrated system proposals or projects.

E. Market Analysis. Prior to conducting R&D on a technology or product development, the Soldier Technology Transition Office will carry out a market analysis to determine the potential for the development to meet the customer's needs and/or to become a commercial success and to identify potential industry and academia participants.

F. Product Test and Evaluation. The Soldier Technology Transition Office will participate in standards analysis and development and will maximize inter-agency collaboration. Products may be tested and evaluated at the request of and by its operating members and under specific user operational scenarios, to assure the capabilities are consistent with the needs of the user and provide the requisite levels of protection and operational effectiveness and to evaluate them in non-conventional applications, perhaps revealing new commercial applications/markets.

G. Network Services. Where appropriate, the Soldier Technology Transition Office will act as a network agent to match capabilities and sources from government, industry an academia in support of its members.

H. Customer Support. The Soldier Technology Transition Office will maintain a capability to respond to customer's needs in terms of field problems encountered with protective equipment and defense science and technology.

I. Conferences. The Soldier Technology Transition Office will sponsor and conduct conferences and symposia on subject matters fitting into the scope of the Soldier Technology Transition Office, as outlined above.

J. Proposals that address the process of gaining advocacy from private industry, academia, and government entities

K. Proposals that address the Innovative Technology for the Soldier Technology Transition Office or suggest ways of developing effective alliances/strategic partnerships.

L. Proposals that address potential areas of study, technology vetting procedures, interagency business practices, end item analysis and development based on integrated concepts with high dual-use applicability.

M. Proposals that address the multi-agency alliance and is interested in technology vetting processes as well as research, development, test and evaluation (RDT&E) efforts, such that RDT&E efforts maximize benefits to the end users. Activities include: sharing of intellectual and physical resources, evaluation of multi-user requirements and interagency operating procedures, equipment standardization/standards analysis, concepts of operation and doctrine analysis.

N. Proposals which provide research management oversight, as well as, program management as a research integrator, and coordinates the integration of technologies for the warfighter and first responders.

Communication with the Technical POC prior to submission of a formal proposal is essential.

Technical POC:
Mr. Henry Girolamo, TEL: 508-233-5483 henry.girolamo@natick.army.mil

Contract Data Requirements POC:
Mr. Gary Zimmer, TEL: 508-233-4124 gary.zimmer@us.army.mil

All concept papers, proposals and administrative inquiries should be submitted to:

U.S. Army Soldier Systems Center - Natick
ATTN: AMSSB-RSS (Ms. Gail Bernheart)
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Natick, MA 01760
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